BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Western North Atlantic Coastal Morphotype Stocks

STOCK DEFINITION AND GEOGRAPHIC RANGE

Stock Structure of the Coastal Morphotype

A. Latitudinal distribution and structure along the coast

The coastal morphotype of bottlenose dolphin is continuously distributed along the Atlantic coast south of Long Island, around the Florida peninsula and along the Gulf of Mexico coast. On the basis of differences in mtDNA haplotype frequencies, Curry (1997) concluded that the nearshore animals in the northern Gulf of Mexico and the western North Atlantic represent separate stocks.

Scott et al. (1988) hypothesized a single coastal migratory stock ranging seasonally from as far north as Long Island, NY, to as far south as central Florida, citing stranding patterns during a high mortality event in 1987-88 and observed density patterns along the US Atlantic coast. More recent studies suggest that the single coastal migratory stock hypothesis is incorrect and that there is likely a complex mosaic of stocks (NMFS 2001; McLellan et al. 2003).

Recent genetic analyses of samples from Jacksonville, FL, Georgia, central South Carolina (primarily the estuaries around Charleston), southern North Carolina, and coastal Virginia, using both mitochondrial DNA and nuclear microsatellite markers, indicate that a significant amount of the overall genetic variation can be explained by differences between these areas (NMFS 2001). These results indicate a minimum of five stocks of coastal bottlenose dolphins along the U.S. Atlantic coast and reject the null hypothesis of one homogeneous population of bottlenose dolphins.

Photo-identification studies also support the existence of multiple stocks (NMFS 2001). A coastwide photographic catalogue has been established using contributions from 15 sites from Cape May, NJ, to Cape Canaveral, FL (Urian et al. 1999). No matches have been found between the northernmost and southernmost sites. However, there appears to be a high rate of exchange among northern field sites, where dolphins occur only seasonally, and central North Carolina including the Beaufort area. Other areas of frequent exchange include Beaufort and Wilmington, NC. In contrast to the patterns found in the northern end of the range, there appears to be less movement between southern field sites – there are only two confirmed matches between the relatively large catalogs of Jacksonville, FL, and Hilton Head, SC, for example, and no matches between the Charleston, SC site and other sites.

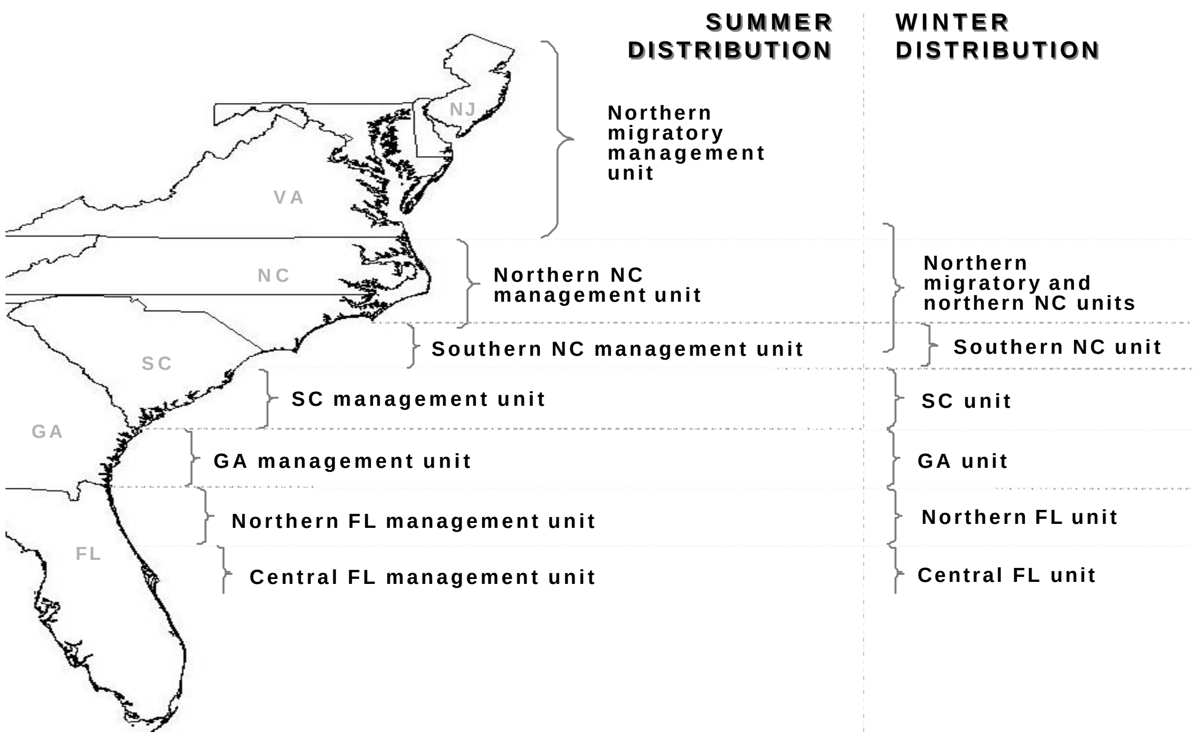
Satellite-linked radio transmitters have been deployed on dolphins in Virginia Beach, VA, Beaufort, NC, Charleston, SC and New Jersey. The movement patterns of animals with satellite tags provided additional information that was complementary to other stock identification approaches. The results, along with photo-identification of freeze-branded animals, indicate that a significant number of dolphins reside in NC in summer and do not migrate. Finally, a dolphin tagged in Virginia Beach, VA, spent the winter between Cape Hatteras and Cape Lookout, NC. indicating seasonal migration between North Carolina and areas further north (NMFS 2001).

Another potential stock has been identified from stable isotope ratios of oxygen (NMFS 2001). Animals sampled along the beaches of North Carolina between Cape Hatteras and Bogue Inlet during the months of February and March show very low stable isotope ratios of ^{18}O relative to ^{16}O (referred to as depleted ^{18}O or depleted oxygen) (Cortese 2000). One possible explanation for the depleted oxygen signature is that there is a resident group of dolphins in Pamlico Sound that move into nearby nearshore areas in the winter. The possibility of a resident group of bottlenose dolphins in Pamlico Sound is supported by the results from satellite telemetry and photo-identification results. Alternatively, these animals may represent a component of the migratory animals that spend their summers at the northernmost end of the range of bottlenose dolphins and winter in North Carolina. Either possibility suggests they represent a separate stock.

There are additional resident estuarine stocks that are likely demographically distinct from coastal stocks, but they are currently included in the coastal management unit definitions. For example, year-round resident populations have been reported at a variety of sites from Charleston, South Carolina (Zolman 1996) to central Florida (Odell and Asper 1990). Seasonal residents and migratory or transient animals also occur in these areas (summarized in Hohn 1997). In the northern part of the range, the patterns reported include seasonal residency, year-round residency with large home ranges, and migratory or transient movements (Barco and Swingle 1996, Sayigh et al. 1997). Communities of dolphins have been recognized in embayments and coastal areas of the Gulf of Mexico (Wells et al. 1996; Scott et al. 1990; Weller 1998), and it is not surprising to find similar situations along the Atlantic coast.

In summary, integration of the results from genetic, photo-identification, satellite telemetry, and stable isotope studies confirms a complex mosaic of coastal bottlenose dolphin stocks.. As an interim measure, pending additional results, seven management units within the range of the coastal morphotype of western North Atlantic bottlenose dolphin have been defined (Figure 1). The true population structure is likely more complex than the seven units identified in this report, and research efforts continue to identify that structure.

Figure 1. Management units of the coastal morphotype of bottlenose dolphins along the Atlantic coast of the U.S. as defined from recent results from genetic, stable isotope ratio, photo-identification, and telemetry studies (NMFS 2001).



B. Longitudinal distribution

Aerial surveys conducted between 1978-1982 (CETAP 1982) north of Cape Hatteras, North Carolina identified two concentrations of bottlenose dolphins, one inshore of the 25 m isobath and the other offshore of the 50 m isobath. The lowest density of bottlenose dolphins was observed over the continental shelf, with higher densities along the coast and near the continental shelf edge. It was suggested, therefore, that the coastal morphotype is restricted to waters < 25 m in depth north of Cape Hatteras (Kenney 1990). Similar patterns were observed during summer months north of Cape Lookout, North Carolina in more recent aerial surveys (Garrison and Yeung 2001; Garrison et al. 2003). However, south of Cape Lookout during both winter and summer months, there was no clear longitudinal discontinuity in bottlenose dolphin sightings (Garrison and Yeung 2001; Garrison et al. 2003). However, dolphin groups observed during aerial surveys cannot be attributed to a specific morphotype based on sighting information alone.

Genetic analysis of tissue samples can be used to identify animals to a specific morphotype (Hoelzel et al., P. Rosel SEFSC unpublished results). An analysis of tissue samples from large vessel surveys during the summers of 1998 and 1999 indicated that bottlenose dolphins within 7.5 km from shore were most likely of the coastal morphotype, and there was an extensive region of overlap between the coastal and offshore morphotypes between 7.5 and 34 km from shore south of Cape Hatteras, NC (Torres et al. 2003). However, relatively few samples were available from the region of overlap, and therefore the longitudinal boundaries based on these initial analyses are uncertain (Torres et al. 2003). Extensive systematic biopsy sampling efforts were conducted using small vessels in the summers of 2001 and 2002 to supplement collections from large vessel surveys. During the winters of 2002 and 2003, additional biopsy collection efforts were conducted in nearshore continental shelf waters of North Carolina and Georgia. A small number of additional biopsy samples were collected in deeper continental shelf waters south of Cape Hatteras during winter 2002. Genetic analyses of these biopsies identified individual animals to the coastal or offshore morphotype. Based upon the genetic results from all surveys combined, a logistic regression approach was used to model the probability that a particular bottlenose dolphin group is of the coastal morphotype as a function of environmental variables including depth, sea surface temperature, and distance from shore. These models were used to partition the bottlenose dolphin groups observed during aerial surveys between the two overlapping morphotypes (Garrison et al. 2003).

The genetic results and spatial patterns observed in aerial surveys indicate both regional and seasonal differences in the longitudinal distribution of the two morphotypes in coastal Atlantic waters. North of Cape Lookout, North Carolina (i.e., northern migratory and northern North Carolina management units) during summer months, the previously observed pattern of strong nearshore aggregation of bottlenose dolphins was again observed. All biopsy samples collected from nearshore waters (<20 m depth) were of the coastal morphotype and all offshore samples (> 40m depth) were of the offshore morphotype. The genetic results confirm separation of the two populations in this region during summer months. South of Cape Lookout, NC, the probability of an observed bottlenose dolphin group being of the coastal morphotype declined with increasing depth; however, there was significant spatial overlap between the two morphotypes. Offshore morphotype bottlenose dolphins were observed at depths as shallow as 13m, and coastal morphotype dolphins were observed at depths of 31m and 75 km from shore (Garrison et al. 2003). These results indicate significant overlap between the two morphotypes in the southern management units during summer months.

Winter samples were collected primarily from nearshore waters in North Carolina and Georgia. The vast majority of samples collected in nearshore waters of North Carolina during winter were of the coastal morphotype; however, one offshore morphotype group was sampled during November just south of Cape Lookout, North Carolina only 7.3 km from shore. Coastal morphotype samples were also collected further away from shore at 33 m depth and 39 km from shore. The logistic regression model for this region indicated a decline in the probability of a coastal morphotype group with increasing distance from shore; however, the model predictions are highly uncertain due to limited sample sizes and high overlap between the two morphotypes. Samples collected in Georgia waters also indicated significant overlap between the two morphotypes with a declining probability of the coastal morphotype with increasing depth. A coastal morphotype sample was collected well offshore at a distance of 112 km from shore and a depth of 38 m. An offshore sample was collected in 22 m depth at 40 km from shore. As with the North Carolina model, the Georgia logistic regression predictions are uncertain due to limited sample size and high overlap between the two morphotypes (Garrison et al. 2003). The logistic regression models were used to predict the probability that an observed bottlenose group is of the coastal morphotype as a function of habitat variables and spatial location. There remain significant sampling gaps in the biopsy collections, particularly during winter months, that increase the uncertainty of model predictions. Both the predicted probability of a coastal morphotype occurring and the associated uncertainty in that prediction are incorporated into the abundance estimates for coastal morphotype bottlenose dolphin management units.

POPULATION SIZE

Previous abundance estimates for the coastal morphotype of WNA bottlenose dolphin were based primarily upon aerial surveys conducted during the summer and winter of 1995. The surveys were designed based upon the previous assumption of a single coastal migratory stock, and therefore they did not provide complete seasonal and spatial coverage for the more recently defined management units. Previous abundance estimates were also not corrected for visibility bias (Garrison and Yeung 2001). Aerial surveys to update the abundance estimates were conducted during winter (January-February) and summer (July-August) of 2002. Survey tracklines were set perpendicular to the shoreline and included coastal waters to depths of 40m. The surveys employed a stratified design so that most effort was expended in waters shallower than 20m depth where a high proportion of observed bottlenose dolphins were expected to be of the coastal morphotype. Survey effort was also stratified to optimize coverage in seasonal management units. The surveys employed two observer teams operating independently on the same aircraft as an approach to estimate and account for sources of visibility bias.

The winter survey included the region from the Georgia/Florida state line to the southern edge of Delaware Bay. A total of 6,411 km of trackline was completed during the survey, and 185 bottlenose dolphin groups were sighted including 2,114 individual animals. No bottlenose dolphins were sighted north of Chesapeake Bay corresponding to water temperatures <9.5 °C. During the summer survey, 6,734 km of trackline were completed between Sandy Hook, NJ to Ft. Pierce, FL. All tracklines in the 0-20 m stratum, were completed throughout the survey range while offshore lines were completed only as far south as the Georgia-Florida state line. A total of 185 bottlenose dolphin groups were sighted during summer including 2,544 individual animals.

Abundance estimates for bottlenose dolphins in each management unit were calculated using line transect methods and distance analysis (Buckland et al. 1993). The independent and joint estimates from the two survey teams were used to quantify the probability that animals available to the survey on the trackline were missed by the observer teams, or perception bias, using the direct duplicate estimator (Palka, 1995). These estimates were further partitioned between the coastal and offshore morphotypes based upon the results of the logistic regression models and spatial analyses described above. A parametric bootstrap approach was used to incorporate the uncertainty in the logistic regression models into the overall uncertainty in the abundance estimates for each management unit (Garrison et al. 2003).

The aerial surveys included only animals in coastal waters, and the resulting abundance estimates therefore do not include animals inside estuaries that are currently included in the defined management units. An abundance estimate was generated for bottlenose dolphins in Pamlico Sound, North Carolina using mark-recapture methodology (Read et al. 2003), and these estimates were post-stratified to be consistent with management unit definitions (Palka et al. 2001a; Table 1). Since abundance estimates do not exist for all estuarine waters, the overall estimates and PBRs for these management units are negatively biased.

Bottlenose dolphins in the northern migratory stock migrate south during winter months and overlap with those from the northern North Carolina and southern North Carolina management units. It is not possible at this time to apportion the incidental mortality occurring during winter months in North Carolina waters among animals from these three management units. Therefore, a half-year PBR value is applied for each management unit in the summer based upon abundance estimates from summer aerial surveys. During winter months, these three stocks overlap spatially and a half-year PBR is applied to the North Carolina mixed management unit based upon winter aerial survey abundance estimates. For the South Carolina and Georgia management units, the abundance estimates, minimum population size values, and the resulting PBR values are derived using a weighted average of abundance estimates from the winter and summer 2002 aerial surveys. The northern Florida management unit was only surveyed during the summer of 2002 and the winter of 1995. The resulting abundance estimate is therefore the inverse variance weighted average of the seasonal estimates from the available surveys. Finally, the central Florida management unit was only covered during the 1995 surveys. Due to the age of the available abundance estimate, the PBR of the central Florida management unit was set to "undefined".

Table 1. Estimates of abundance and the associated CV, n_{min}, and PBR for each management unit of WNA coastal bottlenose dolphins (Garrison et al. 2003). The PBR for the Northern Migratory, Northern NC, and Southern NC management units are applied semi-annually. For management units south of NC, the PBR is applied annually.

Management Unit		Best Abundance		N_{min}	PBR	
		Estimate	CV		Annual	½ Yr
SUMMER (May - October)						
Northern migratory		17,466	19.1	14,621	(146.2)	73.1
Northern NC						
	oceanic	6,160	51.9	3,255	(32.6)	16.1

	estuary[4]	919	12.5	828	(8.2)	4.2
	BOTH	7,079	45.2	4,083	(40.8)	20.3
Southern NC						
	oceanic	3,645	111.0	1,863	(18.6)	9.3
	estuary[4]	141	15.2	124	(1.2)	0.6
	BOTH	3,786	106.9	1,987	(19.9)	9.9
WINTER (November - April)						
NC mixed[1]		16,913	23.0	13,558	(135.6)	67.8
ALL YEAR						
South Carolina		2,325	20.3	1,963	19.6	na
Georgia		2,195	29.9	1,716	17.2	na
Northern Florida[2]		448	38.4	328	3.3	na
Central Florida[3]		10,652	45.8	na	na	na

[1]NC mixed = northern migratory, Northern NC, and Southern NC

[2]Northern Florida estimates are the inverse variance weighted mean of abundance estimates from the winter 1995 survey and the summer 2002 survey.

[3]Central Florida estimates are from the winter 1995 survey and cannot be used to determine PBR due to their age.

[4]Read et al., 2003

Minimum Population Estimate

The minimum population size (Nmin) for each management was calculated as the lower bound of the 60% confidence interval for a lognormally distributed mean (Wade and Angliss 1997). For the estimates derived from bootstrap resampling, the appropriate Nmin was taken directly from the bootstrap distribution of abundance estimates. These estimates may be negatively biased because they do not include estuarine animals and do not fully account for visibility bias.

Current Population Trend

There are insufficient data to determine the population trend for these stocks .

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are not known for the WNA coastal morphotype. The maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a "recovery" factor (Wade and Angliss 1997). The "recovery" factor is assumed to be 0.50, the default for depleted stocks and stocks of unknown status. This complex of management units incorporates the range of the former "WNA coastal migratory stock" that has been defined as depleted under MMPA guidelines. At least some of these management units are likely depleted relative to their optimum sustainable population (OSP) size due both to mortality during the 1987-1988 die-off and historically high incidental mortality in fisheries relative to PBR. The status of these stocks relative to OSP is best described as unknown, and therefore the recovery factor of 0.5 is appropriate for the PBR calculation. Given the known population structure within the coastal morphotype bottlenose dolphins, it is appropriate to apply PBR separately to each management unit so as to achieve the goals of the MMPA (Wade and Angliss 1997).

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total estimated average annual fishery-related mortality or serious injury resulting from observed fishing trips during 1996-2000 was 233 bottlenose dolphins (CV=0.16) in the mid-Atlantic coastal gillnet fishery. The management units affected by this fishery are the northern migratory, northern North Carolina, and southern North Carolina management units. An estimated 6 (CV= 0.89) mortalities occurred annually in the shark drift gillnet fishery off the coast of Florida during 1999-2002, affecting the Central Florida management unit. No observer data are available for the other fisheries that may interact with WNA coastal bottlenose dolphins. Therefore, the total average annual mortality estimate is considered to be a lower bound of the actual annual human-caused mortality and serious injury.

Fishery Information

Bottlenose dolphins are known to interact with commercial fisheries and occasionally are taken in various kinds of fishing gear including gillnets, seines, long-lines, shrimp trawls, and crab pots (Read 1994; Wang et al. 1994) especially in near-shore areas where dolphin densities and fishery efforts are greatest. There are nine Category II commercial fisheries that interact with WNA coastal bottlenose dolphins in the 2003 MMPA List Of Fisheries (LOF), six of which occur in North Carolina waters. Category II fisheries include the mid-Atlantic coastal gillnet, NC inshore gillnet, mid-Atlantic haul/beach seine, NC long haul seine, NC stop net, Atlantic blue crab trap/pot, Southeast Atlantic gillnet, Southeastern U.S. Atlantic shark gillnet and the Virginia pound net (see 2003 List of Fisheries, 68 FR 41725, July 15, 2003). The mid-Atlantic haul/beach seine fishery also includes the haul seine and swipe net fisheries. The term mid-Atlantic refers to the geographic area south of Long Island, landward to the 72˚ 30' W. line, and north of the line extending due east from the North Carolina/South Carolina border (66 FR 6545, January 22, 2001).

There are five Category III fisheries that may interact with WNA coastal bottlenose dolphins. Three of these are inshore gillnet fisheries: the Delaware Bay inshore gillnet, the Long Island Sound inshore gillnet, and the Rhode Island, southern Massachusetts, and New York Bight inshore gillnet. The remaining two are the shrimp trawl and mid-Atlantic menhaden purse seine fisheries. There are have been no takes observed in any of these fisheries.

Mid-Atlantic Coastal Gillnet

This fishery has the highest documented level of mortality of WNA coastal morphotype bottlenose dolphins, and the North Carolina sink gillnet fishery is its largest component in terms of fishing effort and observed takes. Of 12 observed mortalities between 1995-2000, 5 occurred in sets targeting spiny or smooth dogfish and another in a set targeting "shark" species, 2 occurred in striped bass sets, 2 occurred in Spanish mackerel sets, and the remainder were in sets targeting kingfish, weakfish, or finfish generically (Rossman and Palka 2001). Only two bottlenose dolphin mortalities were observed in 2001-2002, both occurring during in the winter mixed North Carolina unit. The overall estimated level of mortality has declined during the past two years associated with reductions in fishery effort, reduced levels of observer coverage, and reduced bycatch rates (Rossman and Palka, in review). Due to these significant changes in the behavior of the fishery, bycatch estimates for these fisheries are separated into two periods covering from 1996-2000 and 2001-2002 (Table 2).

Table 2. Summary of the 1996-2002 incidental mortality of bottlenose dolphins (*Tursiops truncatus*) by management unit in the commercial mid-Atlantic coastal gillnet fisheries. Data include the years sampled (Years), the number of vessels active within the fishery (Vessels), type of data used (Data Type), observer coverage (Observer Coverage), mortalities recorded by on-board observers (Observed Mortality), estimated annual mortality (Estimated Mortality), estimated CV of the annual mortality (Estimated CVs), and mean annual mortality (CV in parentheses).

Seasonal Management Unit	Years	Vessels	Data Type[1]	Observer Coverage [2]	Observed Serious Injury	Observed Mortality	Estimated Mortality	Estimated CVs [3]	Mean Annual Mortality
Summer Northern Migratory	1996-2000	NA	Obs. Data, NER Dealer Data	.05, .03, .02, .03, .03,	0, 0, 0, 0, 0	0, 0, 1, 1, 1,	33, 30, 37, 19, 30,	0.48, 0.48, 0.48, 0.48, 0.48	30 (0.22)
	2001-2002			.02, .01	0, 0	0, 0	11, 11	0.35, 0.35	11 (0.25)

Summer Northern NC	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.01, .00, <.01, .01, .03,	0, 0, 0, 0, 0	1, 0, 0, 0, 0,	27, 33, 17, 13, 26,	0.61, 0.61, 0.61, 0.61, 0.61	23 (0.29)
	2001-2002			.01, <.01	0, 0	0, 0	8, 8	1.06, 1.06	8 (0.75)
Summer Southern NC	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.00, .00, .01, .03, .03,	0, 0, 0, 0, 0	0, 0, 0, 0, 0	0, 0, 0, 0, 0	NA	0 (NA)
	2001-2002			.02, <.01	0, 0	0, 0	0, 0	NA	0 (NA)
Winter NC mixed	1996-2000	NA	Obs. Data, NCDMF Dealer Data	.01, .01, .02, .02, .02,	0, 0, 0, 0, 0	1, 0, 1, 2, 2,	173, 211, 175, 196, 146,	0.46, 0.46, 0.46, 0.46, 0.46	180 (0.21)
	2001-2002			.01, .01	0, 0	0, 2	67, 50	0.45, 0.45	58 (0.32)
Total	2001-2002 Only								77 (0.26)

NA=Not Available

1 Observer data (Obs. data) are used to measure bycatch rates; the USA data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. The NEFSC collects weighout landings data that are used as a measure of total effort for the USA sink gillnet fisheries.

2 The observer coverage for the mid-Atlantic coastal sink gillnet fishery is measured in tons of fish landed.

3 The annual estimates of mortality from 1998-2000 were generated by applying one bycatch rate per management unit as estimated by a GLM (Palka and Rossman 2001). The CV does not account for variability that may exist in the unit of total landings (mt) from each year that are used to expand the bycatch rate. Therefore, the CV is the same for all five annual estimates.

4 The annual estimates of mortality from 2001-2002 were generated by applying the same method used in Palka and Rossman (2001). An new factor variable was added to the model to separate the time series of historical data (1996-2000) from data collected during the recent time period (2001-2002) (Rossman 2004, in review).

South Atlantic Shark Gillnet

Observed takes of bottlenose dolphins occurred primarily during winter months when the fishery operates in waters off of southern Florida. Fishery observer coverage outside of this time and area has increased significantly in the last 2 years, and there was one observed mortality during summer months in fishing operations off of Cape Canaveral. All observed fishery takes are restricted to the Central Florida management unit of coastal bottlenose dolphin. Total bycatch mortality has been estimated for 1999-2002 following methods described in (Garrison 2003) (Table 3).

Table 3. Summary of the 1999-2002 incidental mortality of bottlenose dolphins (Tursiops truncatus) by management unit in the driftnet fishery in federal waters off the coast of Florida. Data include years sampled (Years), number of vessels active within the fishery (Vessels), type of data used (Data Type), annual observer coverage (Observer Coverage), mortalities recorded by on-board observers (Observed Mortality), estimated annual mortality (Estimated Mortality), estimated CV of the annual mortality (Estimated CVs), and mean annual mortality (CV in parentheses).

Seasonal Management Unit	Years	Vessels	Data Type [1]	Observer Coverage [2]	Observed Serious Injury	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
Northern Florida	1999-2002	6	Obs. Data, SEFSC FVL	0.29, 0.23, 0.07, 0.20	0, 0, 0, 0	0, 0,0,0	0, 0, 0, 0	NA	0
Central Florida	1999-2002	6	Obs. Data, SEFSC FVL	0.09, 0.15, 0.42, 0.25	0, 0, 0, 0	4, 1, 4, 1	12, 2, 4, 7	0.78, 1, 0, 1	6 (0.89)

NA=Not Available

1 Observer data are used to estimate bycatch rates. The SEFSC Fishing Vessel Logbook (FVL) is used to estimate effort as total number of vessel trips per bottlenose dolphin management unit.

2 Observer coverage in the central Florida management unit is largely restricted to the period between January - March south of 27° 51' N.

Beach Haul Seine

A total of 2 coastal bottlenose dolphin takes were observed, in the mid-Atlantic beach haul seine fishery: 1 in May 1998 and 1 in December 2000.

Crab Pots

Between 1994 and 1998, 22 bottlenose dolphin carcasses (4.4 dolphins per year on average) recovered by the Stranding Network between North Carolina and Florida's Atlantic coast displayed evidence of possible interaction with a trap/pot fishery (i.e., rope and/or pots attached, or rope marks). Additionally, at least 5 dolphins were reported to be released alive (condition unknown) from blue crab traps/pots during this time period. During 2003, two bottlenose dolphins were observed entangled in crab pot lines in South Carolina.

Virginia Pound Nets

Stranding data for 1993-1997 document interactions between WNA coastal bottlenose dolphins and pound nets in Virginia. Two bottlenose dolphin carcasses were found entangled in the leads of pound nets in Virginia during 1993-1997, for an average of 0.4 bottlenose dolphin strandings per year. A third record of an entangled bottlenose dolphin in Virginia in 1997 may have been applicable to this fishery. This entanglement involved a bottlenose dolphin carcass found near a pound net with twisted line marks consistent with the twine in the nearby pound net lead rather than with monofilament gillnet gear.

Shrimp Trawl

One bottlenose dolphin was recovered dead from a shrimp trawl in Georgia in 1995 (Southeast USA Marine Mammal Stranding Network unpublished data), and another was taken in 1996 near the mouth of Winyah Bay, SC, during a research survey. No other bottlenose dolphin mortality or serious injury has been previously reported to NMFS.

Menhaden Purse Seine

The Atlantic menhaden purse seine fishery historically reported an annual incidental take of 1 to 5 bottlenose dolphins (NMFS 1991, pp. 5-73). However, no observer data are available, and this information has not been updated for some time.

Other Mortality

From 1997-2000, 1,382 bottlenose dolphins were reported stranded along the Atlantic coast from New York to Florida (Hohn and Martone 2001; Hohn et al. 2001; Palka et al. 2001b, Northeast Regional Stranding Program, Southeast Regional Stranding Program). Between 2001-2003, 977 bottlenose dolphins stranded along the Atlantic coast from New York to Florida (Table 4) Of these, it was possible to determine whether or not a human interaction had occurred for 459 (47%); for the remainder it was not possible to make that determination. Of those cases where a cause could be determined, 37% of the carcasses were determined to have been involved in a human interaction on average coastwide, and the majority of these were classified as fisheries interactions. However, this proportion ranged widely and was highest Virginia (71%) and North Carolina (43%).

The nearshore habitat occupied by the coastal morphotype is adjacent to areas of high human population and in the northern portion of its range is highly industrialized. The blubber of stranded dolphins examined during the 1987-88 mortality event contained anthropogenic contaminants in levels among the highest recorded for a cetacean (Geraci 1989). There are no estimates of indirect human-caused mortality resulting from pollution or habitat degradation.

Table 4. Summary of bottlenose dolphins stranded along the Atlantic Coast of the US. Total Stranded is further stratified into carcasses with signs of human interaction, those without any signs, and those where human interaction could not be determined (CBD). Human Interaction is stratified into stranded animals with line or nets marks or gear attached (Fishery Interaction), cleanly removed (cut off) appendages or cuts on the body (Mutilation), and other indications of human interactions such as propellor wounds. Florida strandings include only the Atlantic coast of Florida-extending to Key West.

STATE	**2001**	**2002**	**2003**
New York Total Stranded	**1**	**1**	**2**
Human Interaction			
---- Fishery Interaction	0	0	0
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	0	0	1
CBD	1	1	1
New Jersey Total Stranded	**11**	**11**	7
Human Interaction			
---- Fishery Interaction	1	1	1
---- Mutilation	0	0	0
---- Other	0	1	0
No Human Interaction	7	4	5
CBD	3	5	1
Delaware Total Stranded	**6**	**13**	**18**
Human Interaction			
---- Fishery Interaction	0	1	1
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	3	8	13
CBD	3	4	4
Maryland Total Stranded	**3**	**5**	**10**
Human Interaction			
---- Fishery Interaction	0	0	1
---- Mutilation	0	0	0
---- Other	0	0	0
No Human Interaction	1	2	8
CBD	2	3	1
Virginia Total Stranded	**71**	**68**	**60**
Human Interaction			
---- Fishery Interaction	17	15	25
---- Mutilation	1	2	0
---- Other	1	4	0
No Human Interaction	8	7	12
CBD	44	39	23
N. Carolina Total Stranded	**87**	**94**	**69**
Human Interaction			
---- Fishery Interaction	9	13	11
---- Mutilation	0	2	0
---- Other	0	2	0
No Human Interaction	16	15	16
CBD	62	62	42
S. Carolina Total Stranded	**69**	**28**	**35**
Human Interaction			
---- Fishery Interaction	3	4	3
---- Mutilation	0	0	0
---- Other	3	0	0
No Human Interaction	23	13	17
CBD	40	11	15
Georgia Total Stranded	**23**	**11**	**17**
Human Interaction			
---- Fishery Interaction	1	0	0
---- Mutilation	0	0	0
---- Other	1	0	0
No Human Interaction	5	0	2
CBD	16	11	15
Florida Total Stranded	**101**	**82**	**74**
Human Interaction			
---- Fishery Interaction	9	8	11
---- Mutilation	0	0	0
---- Other	1	2	0
No Human Interaction	46	50	21
CBD	45	22	42
Total	**372**	**313**	**292**

STATUS OF STOCKS

The coastal migratory stock was designated as depleted under the MMPA. From 1995-2001, NMFS recognized only a single migratory stock of coastal bottlenose dolphins in the WNA, and the entire stock was listed as depleted. The management units in this report now replace the single coastal migratory stock. A re-analysis of the depletion designation on a management unit basis needs to be undertaken. In the interim, because one or more of the management units may be depleted, all management units retain the depleted designation. In addition, mortality exceeded PBR in the North Carolina winter mixed stocks during the period from 1996-2000 (Table 1). All prior estimates cover only part of the range of management units spatially or temporally, include the offshore morphotype, or are otherwise compromised, therefore population trends cannot be determined due to insufficient data. The species is not listed as threatened or endangered under the Endangered Species Act, but the management units are strategic stocks due to the depleted listing under the MMPA.

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BOTTLENOSE DOLPHIN (*Tursiops truncatus*): Western North Atlantic Offshore Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two morphologically and genetically distinct bottlenose dolphin morphotypes (Duffield *et al.* 1983; Duffield 1986) described as the coastal and offshore forms. Both inhabit waters in the western North Atlantic Ocean (Hersh and Duffield 1990; Mead and Potter 1995; Curry and Smith 1997) along the U.S. Atlantic coast. The offshore and nearshore ecotypes are genetically distinct using both mitochondrial and nuclear markers (Hoelzel *et al.* 1998). The offshore form is distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic Ocean.

Bottlenose dolphins which stranded alive in the western North Atlantic in areas with direct access to deep oceanic waters had hemoglobin profiles which matched that of the offshore morphotype (Hersh and Duffield 1990). Hersh and Duffield (1990) also described morphological differences between offshore morphotype dolphins and dolphins with hematological profiles matching the coastal morphotype which had stranded in the Indian/Banana River in Florida. North of Cape Hatteras, there is clear separation of the two morphotypes along the bathymetry gradient during summer months. Aerial surveys flown during 1979-1981 indicated a concentration of bottlenose dolphins in waters < 25 m corresponding to the coastal morphotype, and an area of high abundance along the shelf break corresponding to the offshore stock (CETAP 1982; Kenney 1990). Biopsy tissue sampling and genetic analysis demonstrated that bottlenose dolphins concentrated close to shore were of the coastal morphotype, while those in waters > 40 m depth were from the coastal morphotype (Garrison *et al.* 2003). However, during winter months and south of Cape Hatteras, NC the range of the coastal and offshore morphotypes overlap to some degree. Torres *et al.* (2003) found a statistically significant break in the distribution of the ecotypes at 34 km from shore based upon the genetic analysis of tissue samples collected in nearshore and offshore waters. The offshore morphotype was found exclusively seaward of 34 km and in waters deeper than 34 m. Within 7.5 km of shore, all animals were of the coastal morphotype. Systematic biopsy collection surveys were conducted coastwide during the summer and winter between 2001-2003 to evaluate the degree of spatial overlap between the two morphotypes. Over the continental shelf south of Cape Hatteras, NC the two morphotypes overlap spatially, and the probability of a sampled group being from the offshore morphotype increased with increasing depth based upon a logistic regression analysis. Offshore morphotype animals have been sampled as close as 7.3 km from shore in water depths of 13 m (Garrison *et al.* 2003).

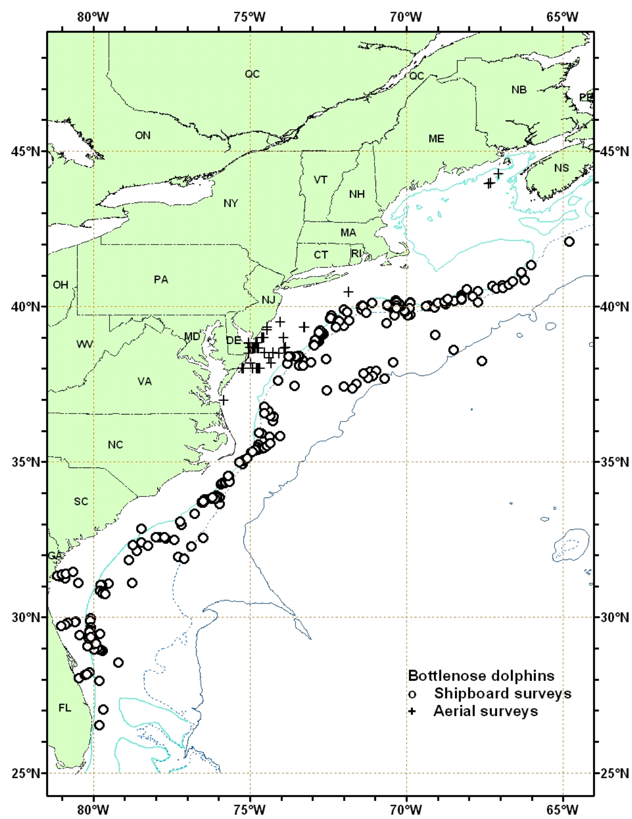

Figure 1. Distribution of bottlenose dolphin sightings from NEFSC and SEFSC aerial surveys during summer in 1998, 1999, and 2004. Isobaths are at 100 m, 1,000 m, and 4,000 m.

Seasonally, bottlenose dolphins occur over outer continental shelf and inner slope waters as far north as Georges Bank (Figure 1; CETAP 1982; Kenney 1990). Sightings occurred along the continental shelf break from Georges Bank to Cape Hatteras during spring and summer (CETAP 1982; Kenney 1990). In Canadian waters, bottlenose dolphins have occasionally been sighted on the Scotian Shelf, particularly in the Gully (Gowans and Whitehead 1995; NMFS unpublished data). Recent information from Wells *et al.* (1999) indicates that the range of the offshore bottlenose dolphin may include waters beyond the continental slope and that offshore bottlenose dolphins may move between the Gulf of Mexico and the Atlantic. Dolphins with characteristics of the offshore type have been stranded as far south as the Florida Keys.

POPULATION SIZE

An abundance of 16,689 (CV=0.32) bottlenose dolphins was estimated from a line-transect sighting survey conducted during July 6 to September 6, 1998, by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Figure 1; Palka et al., in review). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and g(0), the probability of detecting a group on the track line. Aerial data were not corrected for g(0).

An abundance of 13,085 (CV=0.40) for bottlenose dolphins was estimated from a shipboard line transect sighting line-transect survey conducted between 8 July and 17 August 1998 that surveyed 54,570163 km of track line in waters south of Maryland (38°N) (Fig. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland et al. 2001; Thomas et al. 1998) where school size bias and ship attraction were accounted for.

During the summer (June - July) of 2002, aerial surveys were conducted along the U.S. Atlantic coast between Florida and New Jersey. A total of 6,734 km of trackline were completed during the summer survey between Sandy Hook, NJ to Ft. Pierce, FL. The abundance of bottlenose dolphins in survey strata were calculated using line transect methods and distance analysis, and the direct duplicate estimator was used to account for visibility bias (Buckland et al. 1993; Palka 1995). These estimates were further partitioned between the coastal and offshore morphotypes based upon the results of the logistic regression models and spatial analyses described above. A parametric bootstrap approach was used to incorporate the uncertainty in the logistic regression models into the overall uncertainty in the abundance estimate for offshore bottlenose dolphins (Garrison et al. 2003). The resulting coastwide abundance estimate for the offshore morphotype in waters < 40 m depth was 26,849 (CV = 0.193).

An abundance of 10,549 (CV = 0.56) for offshore morphotype bottlenose dolphins was estimated from a line transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of 38° N Figure 1; Palka unpubl.). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and g(0), the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpubl.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths ≥ 50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binocluars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and there were a total of 473 cetacean sightings. Sightings were most frequent in waters North of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (g(0)) and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka, 1995; Buckland et al., 2001). The resulting abundance estimate for offshore morphotype bottlenose dolphins between Florida and Maryland was 44,953 (CV = 0.26).

The best available estimate for offshore morphotype bottlenose dolphins is the sum of the estimates from the summer 2002 aerial survey covering the continental shelf, the summer 2004 vessel survey South of Maryland, and the summer 2004 vessel and aircraft surveys North of Maryland. This joint estimate provides complete coverage of the offshore morphotype habitat from Florida to Georges Bank during summer months. The combined abundance estimate from these surveys is 82,351 (CV = 0.17).

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The minimum population estimate for western North Atlantic offshore bottlenose dolphin is 71,382.

Current Population Trend

The data are insufficient to determine population trends. Previous estimates cannot be applied to this process because previous survey coverage of the species' habitat was incomplete.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al*. 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential biological removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for offshore bottlenose dolphins is 71,382. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic offshore bottlenose dolphin is 714.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Total estimated mean annual fishery-related mortality for this stock during 1998-2002 was 27 (CV=1.12) bottlenose dolphins.

Fisheries Information

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic pair trawl, New England multispecies sink gillnet, North Atlantic bottom trawl and pelagic longline fisheries.

Pelagic Longline

The pelagic longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ (SEFSC unpublished data). Interactions between the pelagic longline fishery and bottlenose dolphins have been reported; however, a vessel may fish in more than one statistical reporting area and it is not possible to separate estimates of fishing effort other than to subtract Gulf of Mexico effort from Atlantic fishing effort, which includes the Caribbean Sea. During 1993-1998, in waters not including the Gulf of Mexico, 1 bottlenose dolphin was caught and released alive during 1993, and 1 was caught and released alive during 1998. No bottlenose dolphins have been observed taken in the pelagic longline fishery since 1998 (Garrison, 2003; Garrison and Richards, 2004, Yeung, 1999).

Pelagic Drift Gillnet

Estimated bottlenose dolphin mortalities (CV in parentheses) extrapolated for each year were 72 in 1989 (0.18), 115 in 1990 (0.18), 26 in 1991 (0.15), 28 in 1992 (0.10), 22 in 1993 (0.13), 14 in 1994 (0.04), 5 in 1995 (0), 0 in 1996, and 3 in 1998 (0). Since this fishery no longer exists, it has been excluded from Table 1.

Pelagic Pair Trawl

Thirty-two bottlenose dolphin mortalities were observed between 1991 and 1995. Estimated annual fishery-related mortality (CV in parentheses) was 13 dolphins in 1991 (0.52), 73 in 1992 (0.49), 85 in 1993 (0.41), 4 in 1994 (0.40) and 17 in 1995 (0.26). Since this fishery no longer exists, it has been excluded from Table 1.

North Atlantic Bottom Trawl

One bottlenose dolphin mortality was documented in 1991 and the total estimated mortality in this fishery in 1991 was 91 (CV=0.97). Since 1992 there were no bottlenose dolphin mortalities observed in this fishery.

Squid, Mackerel and Butterfish

Although there were reports of bottlenose dolphin mortalities in the foreign fishery during 1977-1988, there were no fishery-related mortalities of bottlenose dolphins reported in the self-reported fisheries information from the mackerel trawl fishery during 1990-1992.

New England Multispecies Sink Gillnet

The first observed mortality of bottlenose dolphins was recorded in 2000. This was genetically identified as an offshore, deep-water ecotype. The estimated annual fishery-related serious injury and mortality attributable to this fishery (CV in parentheses) was 0 from 1996-1999, and 132 (CV=1.16) in 2000. There have been no observed bottlenose dolphin mortalities since 2000 in this fishery (Table 1).

Mid-Atlantic Coastal Gillnet

Bottlenose dolphins were only reported during the trips in 1998, when 1 mortality was observed as a result of this fishery. Though this dolphin was not genetically identified, it is being treated as an offshore, deep-water ecotype because it was caught in the offshore habitat and statistical analyses of all biopsied bottlenose dolphins caught in this offshore habitat indicate this animal has a high probability of being the offshore ecotype. Observed effort was concentrated off New Jersey and scattered between Delaware and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality attributed to this fishery was 0 in 1995 through 1997, 4 (CV=0.7) in 1998, and 0 from 1999 through 2000. A bottlenose dolphin was captured in the region of overlap over the continental shelf in the mid-Atlantic gillnet fishery during May, 2001. Mortality estimates have not been developed for the offshore morphotype during 2001-2002 due to the uncertainties associated with the relative distribution of the two morphotypes.

Table 1. Summary of the incidental mortality of bottlenose dolphins (*Tursiops truncatus*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the mortalities recorded by on-board observers (Observed Mortality), the estimated annual mortality (Estimated Mortality), the estimated CV of the annual mortality (Estimated CVs) and the mean annual mortality (CV in parentheses).

Fishery	Years	Vessels	Data Type [1]	Observer Coverage [2]	Observed Serious Injury	Observed Mortality	Estimated Mortality	Estimated CVs	Mean Annual Mortality
New England Multisp. Sink Gillnet	99-03		Obs. Data Dealer Reports, Logbooks	.06, .06, .04, .02, .03	0, 0, 0, 0, 0	0, 1, 0, 0, 0	0, 132, 0, 0, 0	0, 1.16, 0, 0, 0	26 (1.16)
mid-Atlantic Coastal Gillnet	99-03	Unk[3]	Obs. Data Dealer Reports	.02, .02, .02, .01, .01	0, 0, 0, 0, 0	0, 0, 1 , 0, 0	4, 0, 0, NA, NA	0.7, 0, 0, NA, NA	1 (0.7)
TOTAL									27 (1.12)

1 Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook (logbook) data collected by the Southeast Fisheries Science Center (SEFSC) are used to measure total effort for the pelagic drift gillnet fishery. The NEFSC collects landings data (Dealer Reports), and total landings are used as a measure of total effort for the gillnet fisheries. Mandatory vessel trip reports (Logbook) data are used to determine the spatial distribution of fishing effort in the Northeast multispecies sink gillnet fishery.

2 Observer coverage of the Northeast multispecies sink gillnet fishery is measured as the percentage of trips observed. Observer coverage of the mid-Atlantic coastal gillnet fishery is measured as the percentage of tons of fish landed.

3 Number of vessels is not known.

Other Mortality

Bottlenose dolphins are one of the most frequently stranded small cetaceans along the Atlantic coast.

Many of the animals show signs of human interaction (*i.e.*, net marks, mutilation, etc.). The estimated number of animals that represent the offshore stock is presently under evaluation.

STATUS OF STOCK

The status of this stock relative to OSP in the U.S. Atlantic EEZ is unknown. The western North Atlantic offshore bottlenose dolphin is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. Average 1998-2002 annual fishery-related mortality and serious injury does not exceed the PBR therefore this is not a strategic stock. The total fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate.

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ATLANTIC SPOTTED DOLPHIN (*Stenella frontalis*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin, *Stenella frontalis,* formerly *S. plagiodon*, and the pantropical spotted dolphin, *S. attenuata* (Perrin *et al.* 1987). The Atlantic spotted dolphin occurs in two forms which may be distinct sub-species (Perrin *et al.* 1987, 1994; Rice 1998): the large, heavily spotted form which inhabits the continental shelf and is usually found inside or near the 200m isobath; and the smaller, less spotted island and offshore form which occurs in the Atlantic Ocean but is not known to occur in the Gulf of Mexico (Fulling *et al.* 2003; Mullin and Fulling 2003; Mullin and Fulling 2004). Where they co-occur, the offshore form of the Atlantic spotted dolphin and the pantropical spotted dolphin can be difficult to differentiate at sea

Atlantic spotted dolphins are distributed in tropical and warm temperate waters of the western North Atlantic (Leatherwood *et al.* 1976). Their distribution is from southern New England, south through the Gulf of Mexico and the Caribbean to Venezuela (Leatherwood *et al.* 1976; Perrin *et al.* 1994). The large, heavily spotted form of the Atlantic spotted dolphin along the southeastern and Gulf coasts of the United States, which may warrant designation as a distinct sub-species (Rice 1998), inhabits the continental shelf, usually being found inside or near the 200 m isobath (within 250-350km of the coast) but sometimes coming into very shallow water adjacent to the beach (Figure 1). Off the northeast U.S. coast, spotted dolphins are widely distributed on the continental shelf, along the continental shelf edge, and offshore over the deep ocean south of 40° N (CETAP 1982). Atlantic spotted dolphins regularly occur in the inshore waters south of Chesapeake Bay and near the continental shelf edge and continental slope waters north of this region (Payne *et al.* 1984; Mullin and Fulling 2003). Sightings have also been made along the north wall of the Gulf Stream and warm-core ring features (Waring *et al.* 1992). Stock structure in the western North Atlantic is unknown.

POPULATION SIZE

Total numbers of Atlantic spotted dolphins off the U.S. or Canadian Atlantic coast are unknown, although estimates from selected regions of the habitat do exist for select time periods. Because *S. frontalis* and *S. attenuata* are difficult to differentiate at sea, the reported abundance estimates, prior to 1998, are for both species of spotted dolphins combined. Sightings were concentrated in the slope waters north of Cape Hatteras, but in the shelf waters south of Cape Hatteras, with sightings extending into the deeper slope and offshore waters of the mid-Atlantic (Fig. 1).

An abundance of 6,107 undifferentiated spotted dolphins (CV=0.27) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental, shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). As recommended in the GAMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, therefore should not be used for PBR determinations. Further, due to changes in survey methodology these data should not be used to make comparisons to more current estimates.

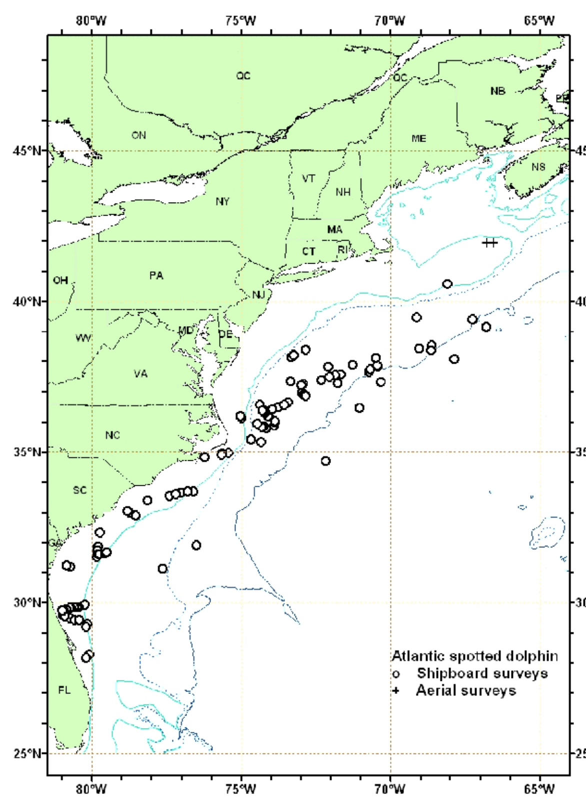

Figure 1. *Distribution of Atlantic spotted dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998 and 2004. Isobaths are at 100 m and 1,000 m.*

An abundance of 4,772 (CV=1.27) undifferentiated spotted dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.* Unpubl. Ms.). Total track line length was 32,600km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 32,043 (CV=1.39) for offshore Atlantic spotted dolphins was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900km of track line in waters north of Maryland (38° N) (Figure 1; Palka *et al.* Unpubl. Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 14,438 (CV=0.63) for Atlantic spotted dolphins was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 4,163km of track line in waters south of Maryland (38°N) (Figure 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 2001) where school size bias and ship attraction were accounted for.

An abundance of 3,040 (CV= 0.46) for Atlantic spotted dolphins was estimated from a line transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (about 38° N) to the Bay of Fundy (about 45° N) (Figure 1; Palka unpubl.). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and g(0), the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpubl.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths $\geq$50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and there were a total of 473 cetacean sightings. Sightings were most frequent in waters North of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (g(0)) and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al*., 2001). The resulting abundance estimate for Atlantic spotted dolphins between Florida and Maryland was 47,400 (CV=0.45).

At their November 1999 meeting, the Atlantic SRG recommended that, without a genetic determination of stock structure, the abundance estimates for the coastal and offshore forms should be combined. There remains debate over how distinguishable both species are at sea, though in the waters south of Cape Hatteras identification to species is made with very high certainty. This does not, however, account for the potential for a mixed species herd, as has been recorded for several dolphin assemblages. Pending further genetic studies for clarification of this problem, a single species abundance estimate will be used as the best estimate of abundance, combining species specific data from the northern as well as southern portions of the species' ranges. This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The best 2004 abundance estimate for Atlantic spotted dolphins is the sum of the estimates from the two 2004 western U.S. Atlantic surveys, 50,440 (CV=0.43), where the estimate from the northern U.S. Atlantic is 3,040 (CV=0.46), and from the southern U.S. Atlantic is 47,400 (CV=0.45).

Table 1. Summary of abundance estimates for both undifferentiated spotted dolphins (1995), and differentiated Atlantic spotted dolphins (1998 and 2004). Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	32,043[1]	1.39
Jul-Aug 1998	Florida to Maryland	14,438[3]	0.63
Jul-Sep 1998	Florida to Gulf of St. Lawrence (COMBINED)	46,481[2]	98
Jun-Aug 2004	Maryland to Bay of Fundy	3,040	0.46
Jun-Aug 2004	Florida to Maryland	47,400	0.45
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	50,440[2]	0.45

[1] This represents the first estimate for the offshore Atlantic spotted dolphin.

[2] This is the combined estimate for the two survey regions

[3] This estimate is a recalculation of the same data reported in previous SARs. For more details see Mullin and Fulling 2003.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997).) The best abundance estimate is 50,440 (CV=0. 43). The minimum population estimates based on the combined offshore and coastal abundance estimates is 35,745.

Current Population Trend

There are insufficient data to determine the population trends for this species, given that surveys prior to 1998 did not differentiate between species of spotted dolphins.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for the Atlantic spotted dolphin is 35,745. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is set to 0.5 because this stock is of unknown status. PBR for the combined offshore and coastal forms of Atlantic spotted dolphins is 357.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated average fishery-related mortality or serious injury to this stock during 1999-2003 was zero Atlantic spotted dolphins (*Stenella* spp.) (Yeung 2001; Garrison 2003; Garrison and Richards, 2004). .

Earlier Interactions

No spotted dolphin mortalities were observed in 1977-1991 foreign fishing activities. Bycatch had been observed by NMFS Sea Samplers in the pelagic drift gillnet and pelagic longline fisheries, but no mortalities or serious injuries have been documented in the pelagic pair trawl, Northeast sink gillnet, mid-Atlantic coastal gillnet, and North Atlantic bottom trawl fisheries; and no takes have been documented in a review of Canadian gillnet and trap fisheries (Read 1994).

Forty-nine undifferentiated spotted dolphin mortalities were observed in the drift gillnet fishery between 1989 and 1998 and occurred northeast of Cape Hatteras within the 183m isobath in February-April and near Lydonia Canyon in October. Six whole animal carcasses that were sent to the Smithsonian were identified as Pantropical spotted dolphins (*S. attenuata*). The remaining animals were not identified to species. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 25 in 1989 (.65), 51 in 1990 (.49), 11 in 1991 (.41), 20 in 1992 (0.18), 8.4 in 1993 (0.40), 29 in 1994 (0.01), 0 in 1995, 2 in 1996 (0.06), no fishery in 1997 and 0 in 1998.

The pelagic longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ. Interactions between the pelagic longline fishery and spotted dolphins have been reported; however, a vessel may fish in more than one statistical reporting area and it is not possible to separate estimates of fishing effort other than to subtract Gulf of Mexico effort from Atlantic fishing effort, which includes the Caribbean Sea. From 1999-2003, excluding the Gulf of Mexico, where one animal was hooked and released alive (Appendix 1), no Atlantic spotted dolphin bycatches were recorded.

Other Mortality

From 1999-2003, 16 Atlantic spotted dolphins were stranded between Massachusetts and Florida (NMFS unpublished data). One animal stranded in North Carolina in 1999, 3 animals stranded in North Carolina and 1 stranded in Georgia in 2000, 2 animals stranded in North Carolina and 3 in Florida in 2001, 2 animals stranded in North Carolina and 2 in Florida in 2002, and 1 animal stranded in Massachusetts, 1 in North Carolina and 1 in Florida in 2003. None of these strandings had documented signs of human interactions.

Table 2. Atlantic spotted dolphin (*Stenella frontalis*) strandings along the U.S. Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
Massachusetts	0	0	0	0	1	1
North Carolina	0	3	2	2	1	8
South Carolina	1	0	0	0	0	1
Georgia	0	1	0	0	0	1

Florida	0	0	3	2	1	6
TOTALS	1	4	5	4	3	17

STATUS OF STOCK

The status of Atlantic spotted dolphins, relative to OSP in the U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. Total fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. Average annual fishery-related mortality and serious injury does not exceed the PBR; therefore, this is not a strategic stock.

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February 2005

CLYMENE DOLPHIN (*Stenella clymene*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The Clymene dolphin is endemic to tropical and sub-tropical waters of the Atlantic (Jefferson and Curry 2003). Clymene dolphins have been commonly sighted in the Gulf of Mexico since 1990 (Mullin *et al.* 1994; Fertl *et al.* 2003), and a Gulf of Mexico stock has been designated since 1995. Four Clymene dolphin groups were sighted during summer 1998 in the western North Atlantic (Mullin and Fulling 2003), and two groups were sighted in the same general area during a 1999 bottlenose dolphin survey (NMFS unpublished). These sightings and stranding records (Fertl *et al.* 2003) indicate that this species routinely occurs in the western North Atlantic. The western North Atlantic population is provisionally being considered a separate stock for management purposes, although there is currently no information to differentiate this stock from the northern Gulf of Mexico stock(s). Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The numbers of Clymene dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this species since it was rarely seen in any surveys.

Clymene dolphins were observed during earlier surveys along the U.S. Atlantic coast. Estimates of abundance were derived through the application of distance sampling analysis (Buckland *et al.* 2001) and the computer program DISTANCE (Thomas *et al.* 1998) to sighting data. Data were collected using standard line-transect techniques conducted from NOAA Ship *Relentless* during July and August 1998 between Maryland (38.00°N) and central Florida (28.00°N) from the 10 m isobath to the seaward boundary of the U.S. EEZ. Transect lines were placed perpendicular to bathymetry in a double saw-tooth pattern. Sightings of Clymene dolphins were primarily on the continental slope east of Cape Hatteras, North Carolina (Fig. 1). The best estimate of abundance for the Clymene dolphin was 6,086 (CV=0.93) (Mullin and Fulling 2003) and represents the first and only estimate to date for this species in the U.S. Atlantic EEZ.

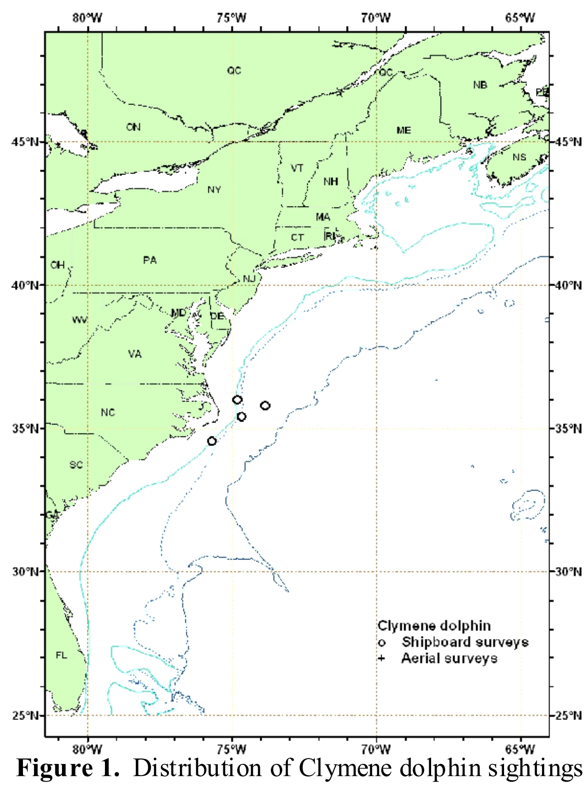

Figure 1. Distribution of Clymene dolphin sightings from NEFSC and SEFSC vessel and aerial summer surveys during 1998 and 2004. Isobaths are at 100 and 1,000 m.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distributed abundance estimate as specified by Wade and Angliss (1997). The best estimate of abundance for the western North Atlantic Clymene dolphin stock, based on the 1998 surveys, is 6,086 (CV=0.93). The minimum population estimate for the western North Atlantic stock is 3,132 Clymene dolphins.

Current Population Trend

There are insufficient data to determine the population trends for this stock

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one half the maximum net productivity rate, and a recovery factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is , 3,132. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic Clymene dolphin stock is 31.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated fishery-related mortality and serious injury to this stock during 1999-2003 was zero Clymene dolphins, as there were no reports of mortalities or serious injury to Clymene dolphins (Yeung 2001; Garrison 2003; Garrison and Richards, 2004).

Other Mortality

There have been 2 reported strandings of Clymene dolphins in the western North Atlantic between 1999-2003. No signs of human interactions were noted in either stranding. There may be some uncertainty in the identification of this species due to similarities with other *Stenella* species.

STATUS OF STOCK

The status of Clymene dolphins, relative to OPS, in the EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this stock. The total fishery-related mortality and serious injury for this stock is unknown, but assumed to be less than 10% of the calculated PBR and can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock because the average annual fishery-related mortality and serious injury has not exceeded PBR for the last two years.

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February 2005

DWARF SPERM WHALE (*Kogia sima*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The dwarf sperm whale (*Kogia sima*) appears to be distributed worldwide in temperate to tropical waters (Caldwell and Caldwell 1989). There are no stranding records for the east Canadian coast (Willis and Baird 1998). Sightings of these animals in the western North Atlantic occur in oceanic waters (Mullin and Fulling 2003; NMFS unpublished data). Dwarf sperm whales and pygmy sperm whales (*K. breviceps*) are difficult to differentiate at sea (Caldwell and Caldwell 1989, Wursig *et al.* 2000), and sightings of either species are often categorized as *Kogia* spp. There is no information on stock differentiation for the Atlantic population. Duffield *et al.* (2003) propose using the molecular weights of myoglobin and hemoglobin, as determined by blood or muscle tissues of stranded animals, as a quick and robust way to provide species confirmation. Using hematological as well as stable-isotope data, Barros *et al.* (1998) speculated that dwarf sperm whales may have a more pelagic distribution than pygmy sperm whales, and/or dive deeper during feeding bouts. Diagnostic morphological characters have also been useful in distinguishing the two *Kogia* species (Barros and Duffield 2003), thus enabling researchers to use stranding data in distributional and ecological studies.. Specifically, the distance from the snout to the center of the blowhole in proportion to the animal's total length, as well as the height of the dorsal fin, in proportion to the animal's total length, can be used to differentiate between the two *Kogia* species when such measurements are obtainable (Barros and Duffield 2003).

POPULATION SIZE

Total numbers of dwarf sperm whales off the U.S. or Canadian Atlantic coast are unknown, although estimates from selected regions of the habitat do exist for select time periods. Because *Kogia sima* and *Kogia breviceps* are difficult to differentiate at sea, the reported abundance estimates are for both species of *Kogia*.

An abundance of 115 (CV=0.61) for *Kogia* spp. was estimated from a line-transect survey conducted from July 6 to September 6, 1998, by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Fig. 1; Palka *et al.,* Unpubl. Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 580 (CV=0.57) for *Kogia* spp. was estimated from a shipboard line-transect sighting survey conducted between 8 July and 17 August 1998 that surveyed ,4,163 km of track line in waters south of Maryland (38°N) (Fig. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 2001; Thomas *et al.* 1998).

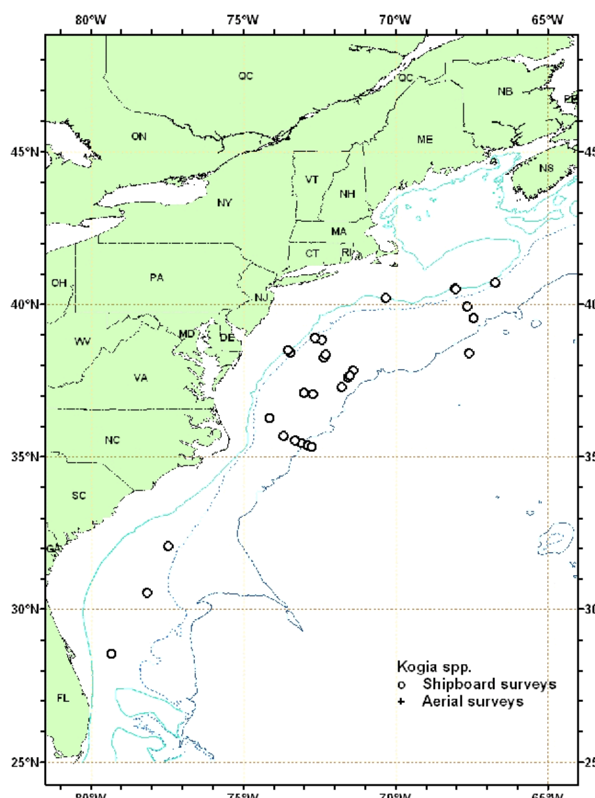

Figure 1. *Distribution of Kogia spp. sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998 and 2004. Isobaths are at 100 m and 1,000 m.*

An abundance of 344 (CV= 0.32) for *Kogia* spp.was estimated from a line transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (about 38° N) to the Bay of Fundy (about 45° N) (Figure 1; Palka unpubl.). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and g(0), the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpubl.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths $\geq$ 50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and there were a total of 473 cetacean sightings. Sightings were most frequent in waters North of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (g(0)) and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al.*, 2001). The resulting abundance estimate for *Kogia* spp. between Florida and Maryland was 37 (CV=0.75).

The best 2004 abundance estimate for *Kogia* spp.is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 381(CV=0.30), where the estimate from the northern U.S. Atlantic is 344 (CV=0.32), and from the southern U.S. Atlantic is 37 (CV=0.75). This joint estimate is considered the best because together these two surveys have the most complete coverage of the species' habitat. A separate estimate of dwarf sperm whale abundance cannot be provided due to the uncertainty of species identification at sea.

Table 1. Summary of abundance estimates for the western North Atlantic *Kogia* spp. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	115	0.61
Jul-Aug 1998	Florida to Maryland	580	0.57
Jul-Sep 1998	Florida to Gulf of St. Lawrence (COMBINED)	695[1]	0.49
Jun-Aug 2004	Maryland to Bay of Fundy	344	0.32
Jun-Aug 2004	Florida to Maryland	37	0.75
Jun-Aug 2004	Bay of Fundy to Florida (COMBINED)	381[1]	0.30

[1]This is the combined estimate for the two survey areas

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Kogia* spp. is 381 (CV=0.30). The minimum population estimate for *Kogia* spp. is 298.

Current Population Trend

The available information is insufficient to evaluate trends in population size for this species in the western North Atlantic.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (Wade and Angliss 1997). The minimum population size is 298. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic *Kogia* spp. is 3.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. There has been no logbook report of fishery-related serious injury recorded off the east coast of Florida in the pelagic longline fishery in 2000 (Table 2) (Yeung 2001; Garrison 2003; Garrison and Richards, 2004). Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was zero for dwarf sperm whales, as there were no reports of mortality or serious injury to dwarf sperm whales (Yeung 2001; Garrison 2003; Garrison and Richards 2004).

Earlier Interactions

No dwarf sperm whale mortalities were observed in 1977-1991 foreign fishing activities. Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet fishery, but no mortalities or serious injuries have been documented in other fisheries.

There was one report of mortality or serious injury to a dwarf sperm whale attributable to the pelagic drift gillnet fishery. Estimated annual fishery-related mortality and serious injury (CV in parentheses) was 0 dwarf sperm whales from 1991-1994, 1.0 in 1995 (CV=0), and 0 from 1996-2003.

Other Mortality

From 1999-2003, 37 dwarf sperm whales were reported stranded between North Carolina and Puerto Rico (Table 2). No dwarf sperm whales were reported to stranded in Nova Scotia from 1990-2004 (T. Wimmer, Nova Scotia Marine Animal Response Society, pers. comm.). The total includes 8 animals stranded in North Carolina and 1 in Georgia in 1999; 4 animals stranded in North Carolina, 1 in South Carolina, and 4 in Florida in 2000; 1 animal stranded in North Carolina, 1 in South Carolina, and 2 in Florida in 2001; 3 animals stranded in Florida and 2 in Puerto Rico in 2002; and 4 animals stranded in North Carolina, 2 in South Carolina, 2 in Georgia, and 2 in Florida in 2003. In addition to the above strandings of *Kogia sima,* there were 8 strandings reported as *Kogia* spp. as follows: 1 *Kogia* spp. stranded in Georgia in 2000, 1 stranded in North Carolina and 2 in Florida in 2002, and 1 stranded in Georgia and 3 in Florida in 2003.

Table 2. Dwarf sperm whale (*Kogia sima*) strandings along the Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
North Carolina	8	4	1[1]	0[1]	4	17
South Carolina	0	1	1	0	2	4
Georgia	1	0[1]	0	0[1]	2[1]	3
Florida	0	4	2	3[2]	2[3]	11
Puerto Rico	0	0	0	2	0	2
TOTALS	9	9	4	5	10	37

[1]1 additional *Kogia* spp. stranded
[2]2 additional *Kogia* spp. stranded
[3]3 additional *Kogia* spp. stranded

There were no documented strandings of dwarf sperm whales along the U.S. Atlantic coast during 1999-

2003 which were classified as likely caused by fishery interactions.

Historical stranding records (1883-1988) of dwarf sperm whales in the southeastern U.S. (Credle 1988), and strandings recorded during 1988-1997 (Barros *et al.* 1998) indicate that this species accounts for about 17% of all *Kogia* strandings in this area. During the period 1990-October 1998, 3 dwarf sperm whale strandings occurred in the northeastern U.S. (Maryland, Massachusetts, and Rhode Island), whereas 43 strandings were documented along the U.S. Atlantic coast between North Carolina and the Florida Keys in the same period. A pair of latex examination gloves was retrieved from the stomach of a dwarf sperm whale stranded in Miami in 1987 (Barros *et al.* 1990). In the period 1987-1994, 1 animal had possible propeller cuts on or near the flukes.

Rehabilitation challenges for *Kogia* spp. are numerous due to limited knowledge regarding even the basic biology of these species. Advances in recent rehabilitation success has potential implications for future release and tracking of animals at sea to potentially provide information on distribution, movements and habitat use of these species (Manire *et al.*, 2004).

STATUS OF STOCK

The status of the pygmy sperm whale relative to OSP in the western U.S. Atlantic EEZ is unknown. This species is not listed as endangered or threatened under the Endangered Species Act. There is insufficient information with which to assess population trends. Total fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock.

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FRASER'S DOLPHIN (*Lagenodelphis hosei*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Fraser's dolphin is distributed worldwide in tropical waters (Perrin *et al.* 1994). Fraser's dolphins are assumed to be part of the cetacean fauna of the tropical western North Atlantic. The paucity of sightings is probably due to naturally low abundance compared to other cetacean species. Sightings in the more extensively surveyed northern Gulf of Mexico are uncommon but occur on a regular basis. Fraser's dolphins have been observed in oceanic waters (>200 m) in the northern Gulf of Mexico during all seasons (Leatherwood *et al.* 1993; Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling, 2004). The western North Atlantic population is provisionally being considered one stock for management purposes. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The numbers of Fraser's dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys. A group of an estimated 250 Fraser's dolphins was sighted in waters 3300 m deep in the western North Atlantic off Cape Hatteras during a 1999 vessel survey (Figure 1; Anon. 1999). Abundances have not been estimated from the 1999 vessel survey in western North Atlantic (Anon. 1999); because the sighting was not made during line-transect sampling effort; therefore, the population size of Fraser's dolphins is unknown.

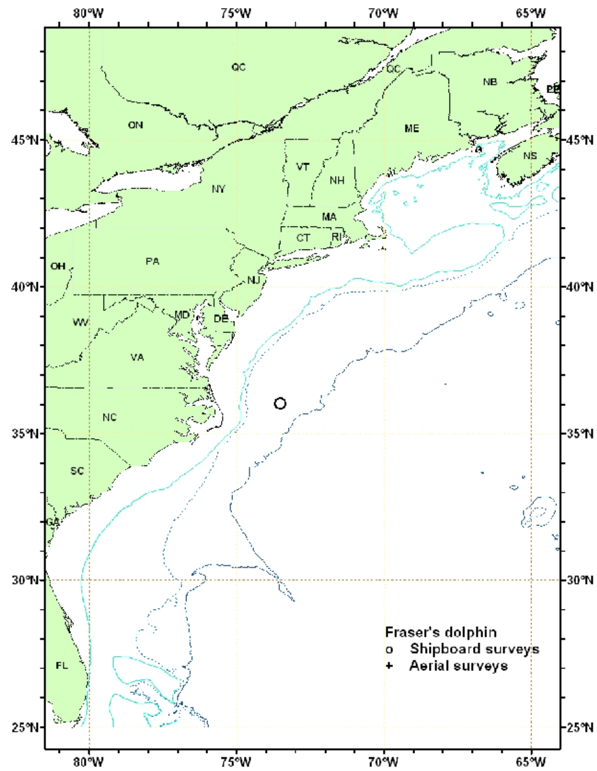

Figure 1. Distribution of Fraser's dolphins from SEFSC vessel surveys during 1998-2002. All sightings are shown. Solid lines indicate the 200 and 2000 m isobaths.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for this stock.

Current Population Trend

There are insufficient data to determine the population trends for this stock .

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal level (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP), is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic Fraser's dolphin stock is unknown because the minimum population size is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was zero Fraser's dolphins, as there were no reports of mortality or serious injury to Fraser's dolphins (Yeung 2001; Garrison 2003; Garrison and Richards, 2004).

Other Mortality

From 1999-2003, 12 Fraser's dolphins were reported stranded between Maine and Puerto Rico (Table 1). The total includes 1 animal stranded in Puerto in 1999 and 1 in 2002, and 10 mass stranded live animals in April 2003 in Lee, Florida. There were no indications of human interactions for these stranded animals.

Table 1. Fraser's dolphin (*Lagenodelphis hosei*) strandings along the U.S. Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
North Carolina	0	0	0	0	0	0
South Carolina	0	0	0	0	0	0
Georgia	0	0	0	0	0	0
Florida	0	0	0	0	10	10
Puerto Rico	1	0	0	1	0	2
TOTALS	1	0	0	1	10	12

[1]Florida live mass stranding of 10 animals in Lee, Florida on April 4, 2003

STATUS OF STOCK

The status of melon-headed whales, relative to OPS, in the U.S. western North Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population size or trends and PBR cannot be calculated for this stock. No fishery-related mortality and serious injury has been observed since 1999; therefore, total fishery-related mortality and serious injury rate can be considered insignificant and approaching zero mortality and serious injury. This is not a strategic stock.

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February 2005

MELON-HEADED WHALE (*Peponocephala electra*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The melon-headed whale is distributed worldwide in tropical to sub-tropical waters (Jefferson *et al.* 1994). Melon-headed whales are assumed to be part of the cetacean fauna of the tropical western North Atlantic. The paucity of sightings is probably due to a naturally low number of groups compared to other cetacean species. Sightings in the more extensively surveyed northern Gulf of Mexico occur in oceanic waters (Mullin *et al.* 1994; Mullin and Fulling, 2004). Sightings of melon-headed whales in the northern Gulf of Mexico were documented in all seasons during aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). The western North Atlantic population is provisionally being considered one stock for management purposes. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The numbers of melon-headed whales off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys. A group of melon-headed whales was sighted during both a 1999 (20 whales) and 2002 (80 whales) vessel survey of the western North Atlantic off of Cape Hatteras, North Carolina in waters >2500 m deep (Figure 1; Anon. 1999: Anon. 2002). Abundances have not been estimated from the 1999 and 2002 vessel surveys in western North Atlantic (Anon. 1999; Anon. 2002); because the sighting was not made during line-transect sampling effort; therefore the population size of melon-headed whales is unknown.

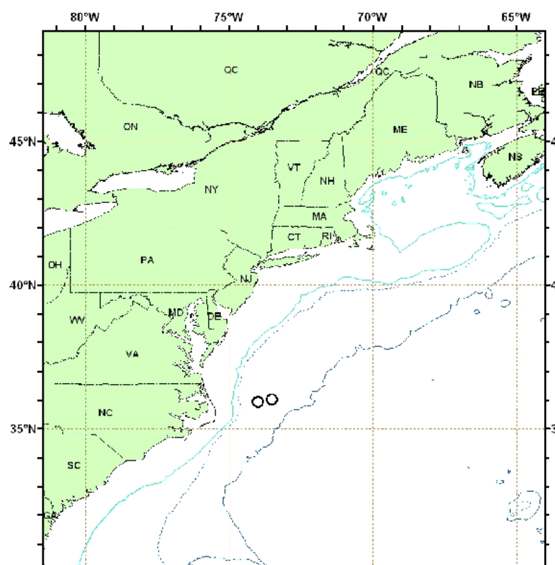

Figure 1. Distribution of melon-headed whales from SEFSC vessel surveys during 1998-2002. All sightings are shown. Solid lines indicate the 200 and 2000 m isobaths.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for this stock.

Current Population Trend

There are insufficient data to determine the population trends for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal level (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OPS), is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic stock of melon-headed whales is unknown because the minimum population size is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was zero melon-headed whales, as there were no reports of mortality or serious injury to melon-headed whales (Yeung 2001; Garrison 2003; Garrison and Richards, 2004).

Other Mortality

From 1999-2003, 1 melon-headed whale was reported stranded in Puerto Rico. There was one additional reported stranding of a melon-headed whale in the western North Atlantic between 1997 and 2002. No evidence of human interaction was apparent for either stranded animal.

STATUS OF STOCK

The status of melon-headed whales, relative to OPS, in the western North Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population size or trends and PBR cannot be calculated for this stock. No fishery-related mortality and serious injury has been observed since 1999; therefore, total fishery-related mortality and serious injury rate can be considered insignificant and approaching zero mortality and serious injury. This is not a strategic stock.

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PANTROPICAL SPOTTED DOLPHIN (*Stenella attenuata*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of spotted dolphin in the Atlantic Ocean, the Atlantic spotted dolphin, *Stenella frontalis,* formerly *S. plagiodon*, and the pantropical spotted dolphin, *S. attenuata* (Perrin *et al.* 1987). The Atlantic spotted dolphin occurs in two forms which may be distinct sub-species (Perrin *et al.* 1987, 1994; Rice 1998): the large, heavily spotted form which inhabits the continental shelf and is usually found inside or near the 200m isobath; and the smaller, less spotted island and offshore form which occurs in the Atlantic Ocean but is not known to occur in the Gulf of Mexico (Fulling *et al.* 2003; Mullin and Fulling 2003; Mullin and Fulling 2004). Where they co-occur, the offshore form of the Atlantic spotted dolphin and the pantropical spotted dolphin can be difficult to differentiate at sea

The pantropical spotted dolphin is distributed worldwide in tropical and some sub-tropical oceans (Perrin 1987; Perrin and Hohn 1994). Sightings of this species in the northern Gulf of Mexico occur over the deeper waters, and rarely over the continental shelf or continental shelf edge (Mullin *et al.* 1991; SEFSC, unpublished data). Pantropical spotted dolphins were seen in all seasons during recent seasonal aerial surveys of the northern Gulf of Mexico, and during recent winter aerial surveys offshore of the southeastern U.S. Atlantic coast (SEFSC unpublished data). Some of the Pacific populations have been divided into different geographic stocks based on morphological characteristics (Perrin 1987; Perrin and Hohn 1994); however, there is no information on stock differentiation in the Atlantic population.

POPULATION SIZE

Total numbers of pantropical spotted dolphins off the U.S. or Canadian Atlantic coast are unknown, although estimates from selected regions of the habitat do exist for select time periods. Because *S. frontalis* and *S. attenuata* are difficult to differentiate at sea, the reported abundance estimates, prior to 1998, are for both species of spotted dolphins combined. Sightings were concentrated in the southeastern edge of Georges Bank, along the Florida shelf and to a more limited degree the Florida slope waters, and offshore in Gulf Stream waters southeast of Cape Hatteras (Fig. 1).

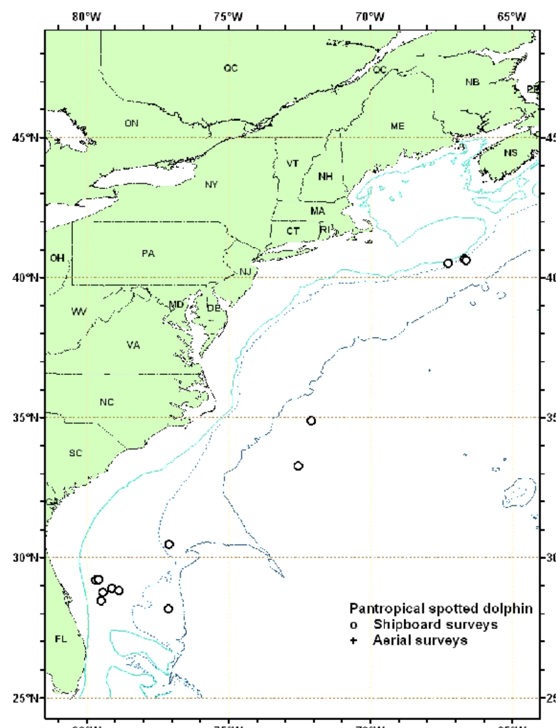

Figure 1. *Distribution of pantropical spotted dolphin sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998 and 2004. Isobaths are at 100m and 1,000m.*

An abundance of 6,107 undifferentiated spotted dolphins (CV=0.27) was estimated from an aerial survey program conducted from 1978 to 1982 on the continental, shelf and shelf edge waters between Cape Hatteras, North Carolina and Nova Scotia (CETAP 1982). As recommended in the GAMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, therefore should not be used for PBR determinations. Further, due to changes in survey methodology these data should not be used to make comparisons to more current estimates.

An abundance of 4,772 (CV=1.27) undifferentiated spotted dolphins was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.*Unpubl. Ms.). Total trackline length was 32,600km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods used were described in Palka (1996).

An abundance of 343 (CV=1.03) for pantropical spotted dolphins was estimated from a line transect sighting survey conducted during July 6 to September 6, 1998 by a ship and plane that surveyed 15,900km of track line in waters north of Maryland (38° N) (Figure 1; Palka *et al.*Unpubl. Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 12, 747 (CV=0.56) for pantropical spotted dolphins was estimated from a shipboard line transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 4,163km of track line in waters south of Maryland (38°N) (Figure 1; Mullin and Fulling 2003). This estimate is a recalculation of the same data reported in previous SARs. For more details see Mullin and Fulling (2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 2003) where school size bias and ship attraction were accounted for.

An abundance of zero for Atlantic spotted dolphins was estimated from a line transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (about 38° N) to the Bay of Fundy (about 45° N) (Figure 1; Palka unpubl)., as no dolphins of this species were observed). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and g(0), the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpubl.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths = 50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and there were a total of 473 cetacean sightings. Sightings were most frequent in waters North of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (g(0)) and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al.*, 2001). The resulting abundance estimate for Atlantic spotted dolphins between Florida and Maryland was 4,439 (CV=0.49).

At their November 1999 meeting, the Atlantic SRG recommended that, without a genetic determination of stock structure, the abundance estimates for the coastal and offshore forms should be combined. There remains debate over how distinguishable both species are at sea, though in the waters south of Cape Hatteras identification to species is made with very high certainty. This does not, however, account for the potential for a mixed species herd, as has been recorded for several dolphin assemblages. Pending further genetic studies for clarification of this problem, a single species abundance estimate will be used as the best estimate of abundance, combining species specific data from the northern as well as southern portions of the species' ranges. This joint estimate is considered best because together these two surveys have the most complete coverage of the species' habitat. The best 2004 abundance estimate for pantropical spotted dolphins is the sum of the estimates from the two 2004 western U.S. Atlantic surveys, 4,439 (CV=0.49), where the estimate from the northern U.S. Atlantic is 0, and from the southern U.S. Atlantic is 4,439 (CV=0.49).

Table 1. Summary of abundance estimates for both undifferentiated spotted dolphins (1995) and differentiated pantropical spotted dolphins (1998, 2004). Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	343[1]	1.03
Jul-Aug 1998	Florida to Maryland	12,747[1]	0.56
Jul-Aug 1998	Florida to Gulf of St. Lawrence (COMBINED)	13,090	0.55
Jun-Aug 2004	Maryland to Bay of Fundy	0	0
Jun-Aug 2004	Florida to Maryland	4,439	0.48
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	4,439	0.48

[1] This represents the first estimates for pantropical spotted dolphin.

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for pantropical spotted dolphins is 4,439 (CV=0. 49) The minimum population estimate for pantropical spotted dolphins is 3,010.

Current Population Trend

There are insufficient data to determine the population trends for this species, because prior to 1998 spotted dolphins (*Stenella* spp) were not differentiated during surveys.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for pantropical spotted dolphins is 3,010 . The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for pantropical dolphins is 30.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated average fishery-related mortality or serious injury to this stock during 1999-2003 was zero pantropical spotted dolphins, as there were no reports of mortality or serious injury to pantropical spotted dolphins (Yeung 2001; Garrison 2003; Garrison and Richards, 2004).

Earlier Interactions

No spotted dolphin mortalities were observed in 1977-1991 foreign fishing activities. Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet and pelagic longline fisheries, but no mortalities or serious injuries have been documented in the pelagic pair trawl, Northeast sink gillnet, mid-Atlantic coastal gillnet, and North Atlantic bottom trawl fisheries; and no takes have been documented in a review of Canadian gillnet and trap fisheries (Read 1994).

Forty-nine undifferentiated spotted dolphin mortalities were observed in the drift gillnet fishery between 1989 and 1998 and occurred northeast of Cape Hatteras within the 183m isobath in February-April, and near Lydonia Canyon in October. Six whole animal carcasses that were sent to the Smithsonian were identified as pantropical spotted dolphins (*S. attenuata*). The remaining animals were not identified to species. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 25 in 1989 (.65), 51 in 1990 (.49), 11 in 1991 (.41), 20 in 1992 (0.18), 8.4 in 1993 (0.40), 29 in 1994 (0.01), 0 in 1995, 2 in 1996 (0.06), no fishery in 1997 and 0 in 1998.

The pelagic longline fishery operates in the U.S. Atlantic (including Caribbean) and Gulf of Mexico EEZ (SEFSC unpublished data). Interactions between the pelagic longline fishery and spotted dolphins have been reported; however, a vessel may fish in more than one statistical reporting area and it is not possible to separate estimates of fishing effort other than to subtract Gulf of Mexico effort from Atlantic fishing effort, which includes the Caribbean Sea. Excluding the Gulf of Mexico where 1 animal was hooked and released alive, no pantropical spotted dolphin bycatches were observed during 1999-2003.

Other Mortality

From 1999-2003, 8 pantropical spotted dolphins were stranded between North Carolina and Puerto Rico (NMFS unpublished data). The 8 mortalities includes the 4 animals stranded in Florida in 1999, 1 animal stranded in North Carolina and 1 in Florida in both 2002 and 2003. There were no documented signs of human interactions in any of these strandings.

Table 2. Pantropical spotted dolphin (*Stenella attenuata*) strandings along the U.S. Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
North Carolina	0	0	0	0	0	0
South Carolina	0	0	0	0	0	0
Georgia	0	0	0	0	0	0
Florida	4	0	1	1	0	6
Puerto Rico	0	0	0	0	0	0
TOTALS	4	0	1	1	0	6

STATUS OF STOCK

The status of pantropical spotted dolphins, relative to OSP in the western U.S. Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population trends for this species. Total fishery-related mortality and serious injury for this stock is less than 10% of the calculated PBR and, therefore, can be considered to be insignificant and approaching zero mortality and serious injury rate. Average annual fishery-related mortality and serious injury does not exceed the PBR; therefore, this is not a strategic stock

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February 2005

PYGMY KILLER WHALE (*Feresa attenutta*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The pygmy killer whale is distributed worldwide in tropical to sub-tropical waters (Jefferson *et al.* 1994). Pygmy killer whales are assumed to be part of the cetacean fauna of the tropical western North Atlantic. The paucity of sightings is probably due to a naturally low number of groups compared to other cetacean species. Sightings in the more extensively surveyed northern Gulf of Mexico occur in oceanic waters (Mullin *et al.* 1994; Mullin and Fulling, 2004). Sightings of pygmy killer whales were documented in all seasons during aerial surveys of the northern Gulf of Mexico between 1992 and 1998 (Hansen *et al.* 1996; Mullin and Hoggard 2000). The western North Atlantic population is provisionally being considered one stock for management purposes. Additional morphological, genetic and/or behavioral data are needed to provide further information on stock delineation.

POPULATION SIZE

The numbers of pygmy killer whales off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock, since it was rarely seen in any surveys. A group of 6 pygmy killer whales was sighted during a 1992 vessel survey of the western North Atlantic off of Cape Hatteras, North Carolina, in waters >1500 m deep (Hansen *et al.* 1994), but this species was not sighted during subsequent surveys (Anon. 1999; Anon. 2002; Mullin and Fulling 2003). Abundance was not estimated for pygmy killer whales from the 1992 vessel survey because the sighting was not made during line-transect sampling effort; therefore, the population size of pygmy killer whales is unknown.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate for this stock.

Current Population Trend

There are insufficient data to determine the population trends for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal level (PBR) is the product of the minimum population size, one-half the maximum productivity rate, and a recovery factor (MMPA Sec. 3.16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OPS), is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic stock of pygmy killer whales is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was zero pygmy killer whales, as there were no reports of mortality or serious injury to pygmy killer whales (Yeung 2001; Garrison 2003; Garrison and Richards, 2004). There has historically been some take of this species in small cetacean fisheries in the Caribbean (Caldwell and Caldwell 1971).

Other Mortality

From 1999-2003, 2 pygmy killer whales were reported stranded between Maine and Puerto Rico (Table 1). The total includes 1 animal stranded in South Carolina and 1 in Georgia in 2003, though there were no indications of human interactions for these stranded animals.

Table 1. Pygmy killer whale (*Feresa attenuata*) strandings along the U.S. Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
North Carolina	0	0	0	0	0	0
South Carolina	0	0	0	0	1	1
Georgia	0	0	0	0	1	1
Florida	0	0	0	0	0	0
Puerto Rico	0	0	0	0	0	0
TOTALS	0	0	0	0	2	2

STATUS OF STOCK

The status of pygmy killer whales, relative to OPS, in the U.S. western North Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population size or trends and PBR cannot be calculated for this stock. No fishery-related mortality and serious injury has been observed since 1999; therefore, total fishery-related mortality and serious injury rate can be considered insignificant and approaching zero mortality and serious injury. This is not a strategic stock.

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PYGMY SPERM WHALE (*Kogia breviceps*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

The pygmy sperm whale (*Kogia breviceps*) appears to be distributed worldwide in temperate to tropical waters (Caldwell and Caldwell 1989). Sightings of these animals in the western North Atlantic occur in oceanic waters (Mullin and Fulling 2003; SEFSC unpublished data). Pygmy sperm whales and dwarf sperm whales (*K. sima*) are difficult to differentiate at sea (Caldwell and Caldwell 1989, Wursig *et al.* 2000), and sightings of either species are often categorized as *Kogia* spp. There is no information on stock differentiation for the Atlantic population. Duffield *et al.* (2003) propose using the molecular weights of myoglobin and hemoglobin, as determined by blood or muscle tissues of stranded animals, as a quick and robust way to provide species confirmation. Using hematological as well as stable-isotope data, Barros *et al.* (1998) speculated that dwarf sperm whales may have a more pelagic distribution than pygmy sperm whales, and/or dive deeper during feeding bouts. Diagnostic morphological characters have also been useful in distinguishing the two *Kogia* species (Barros and Duffield 2003), thus enabling researchers to use stranding data in distributional and ecological studies.. Specifically, the distance from the snout to the center of the blowhole in proportion to the animal's total length, as well as the height of the dorsal fin, in proportion to the animal's total length, can be used to differentiate between the two *Kogia* species when such measurements are obtainable (Barros and Duffield 2003).

POPULATION SIZE

Total numbers of pygmy sperm whales off the U.S. or Canadian Atlantic coast are unknown, although estimates from selected regions of the habitat do exist for select time periods. Because *Kogia breviceps* and *Kogia sima* are difficult to differentiate at sea, the reported abundance estimates are for both species of *Kogia*.

An abundance of 115 (CV=0.61) for *Kogia* spp. was estimated from a line-transect survey conducted from July 6 to September 6, 1998, by a ship and plane that surveyed 15,900 km of track line in waters north of Maryland (38° N) (Fig. 1; Palka *et al.* in review Unpubl. Ms.). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 580 (CV=0.57) for *Kogia* spp. was estimated from a shipboard line -transect sighting survey conducted between 8 July and 17 August 1998 that surveyed 4,163 km of track line in waters south of Maryland (38°N) (Fig. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE (Buckland *et al.* 2001; Thomas *et al.* 1998).

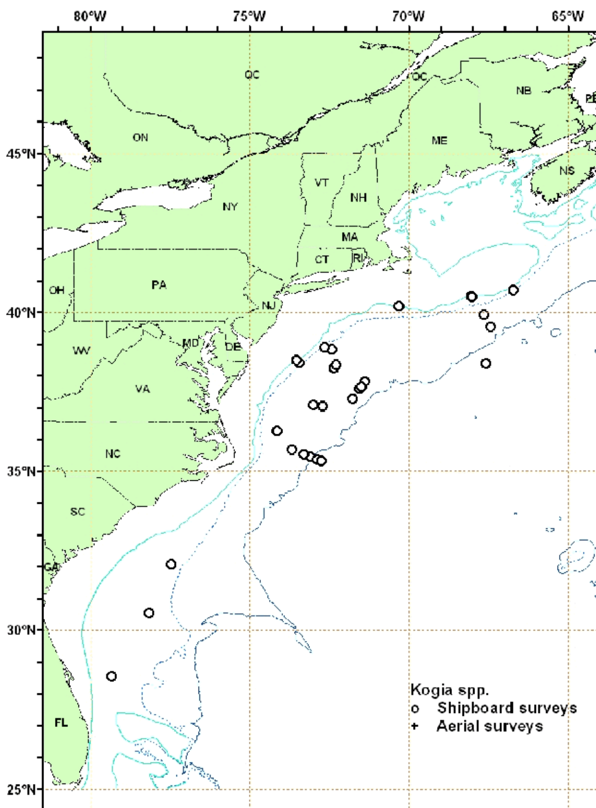

Figure 1: *Distribution of Kogia spp. sightings from NEFSC and SEFSC shipboard and aerial surveys during the summer in 1998 and 2004. Isobaths are at 100 m and 1,000 m.*

An abundance of 344 (CV= 0.32) for *Kogia* spp.was estimated from a line-transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (about 38° N) to the Bay of Fundy (about 45° N) (Figure 1; Palka unpubl.). Shipboard data were collected using the two independent team line-transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and g(0), the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line-transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpubl.).

A survey of the U.S. Atlantic outer continental shelf and continental slope (water depths $\geq$ 50m) between 27.5 – 38 ºN latitude was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and there was a total of 473 cetacean sightings. Sightings were most frequent in waters north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (g(0)) and group-size bias employing line-transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al.*, 2001). The resulting abundance estimate for *Kogia* spp. between Florida and Maryland was 37 (CV=0.75).

The best 2004 abundance estimate for *Kogia* spp.is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 381(CV=0.30), where the estimate from the northern U.S. Atlantic is 344 (CV=0.32), and from the southern U.S. Atlantic is 37 (CV=0.75). This joint estimate is considered the best because together these two surveys have the most complete coverage of the species' habitat. A separate estimate of pygmy sperm whale abundance cannot be provided due to the uncertainty of species identification at sea.

Table 1. Summary of abundance estimates for the western North Atlantic *Kogia* pp. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	115	0.61
Jul-Aug 1998	Florida to Maryland	580	0.57
Jul-Sep 1998	Florida to Gulf of St. Lawrence (COMBINED)	695[1]	0.49
Jun-Aug 2004	Maryland to Bay of Fundy	344	0.32
Jun-Aug 2004	Florida to Maryland	37	0.75
Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	381[1]	0.30

[1] This is the combined estimate for the two survey areas

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Kogia* spp. is 381 (CV=0.30). The minimum population estimate for *Kogia* spp. is 298.

Current Population Trend

The available information is insufficient to evaluate trends in population size for this species in the western North Atlantic.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (Wade and Angliss 1997). The minimum population size is 298. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic *Kogia* spp. is 3.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. There has been one logbook report of fishery-related serious injury recorded off the east coast of Florida in the pelagic longline fishery in 2000 (Table 2) (Yeung 2001; Garrison 2003; Garrison and Richards, 2004). Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was 6 (CV=1.0) *Kogia* spp.

Table 2. Summary of the incidental mortality and serious injury of pygmy sperm whales (*Kogia breviceps*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[3]	Data Type[1]	Observer Coverage	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
Pelagic Longline[2]	99-03	198, 180, 161, 149, 127	Obs. Data Logbook	.04, .04, .02, .04, .02	0, 0, 1,0,0	0, 0, 0, 0, 0	0, 0, 28, 0,0	0, 0 ,0 ,0, 0	0, 0, 28 [2], 0,0	0, 0, 1, 0,0	6 (1.0)
TOTAL											6 (1.0)

1 Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Southeast Fisheries Science Center (SEFSC) Observer Program. NEFSC collects landings data (Weighout), and total landings are used as a measure of total effort for the coastal gillnet fishery. Observed bycatch rates are raised to total fishing effort reported to the SEFSC Atlantic Large Pelagic Logbook.
2 The 2000 mortality estimates were taken from Table 10 in Yeung 2001, and exclude the Gulf of Mexico.
3 Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.

Other Mortality

From 1999-2003, 125 pygmy sperm whales were reported stranded between Maine and Puerto Rico (Table 3). The total includes 7 animals stranded in Florida in 1999; 3 animals stranded in North Carolina, 1 in South Carolina, 7 in Florida and 1 in Puerto Rico in 2000; 1 animal stranded in North Carolina, 4 in South Carolina, 3 in Georgia, and 24 in Florida in 2001; 7 animals stranded in North Carolina, 5 in South Carolina, 4 in Georgia, and 15 in Florida in 2002; and 1 animal stranded in Nova Scotia, 4 animals in North Carolina, 7 in Georgia, and 31 in Florida in 2003. In addition to the above strandings of *Kogia breviceps,* there were 8 strandings reported as *Kogia* spp. as follows: 1 *Kogia* spp. stranded in Georgia in 2000, 1 stranded in North Carolina and 2 in Florida in 2002, 1 stranded in Georgia and 3 in Florida in 2003.

Table 3. Pygmy sperm whale (*Kogia breviceps*) strandings along the Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
Nova Scotia[1]					1	1
North Carolina	0	3	1[2,3]	7[3]	4	15
South Carolina	0	1	4	5	0	10
Georgia	0	0[3]	3	4[3]	7[3]	14
Florida	7[2]	7	24	15[4]	31[5]	84
Puerto Rico	0	1[2]	0	0	0	1
TOTALS	7	12	32	31	43	125

1 Data supplied by Tonya Wimmer, Nova Scotia Marine Animal Response Society (pers. comm.)
2 Signs of human interaction reported
3 1 additional *Kogia* spp. stranded
4 2 additional *Kogia* spp. stranded
5 3 additional *Kogia* spp. stranded

There were 3 documented strandings of pygmy sperm whales along the U.S. Atlantic coast during 1999-2003 which were classified as likely caused by fishery interactions., 1 in Florida in 1999, 1 in Puerto Rico in 2000 and 1 in North Carolina in 2001. In one of the strandings in 2002 of a pygmy sperm whale, red plastic debris was found in the stomach along with squid beaks.

Historical stranding records (1883-1988) of pygmy sperm whales in the southeastern U.S. (Credle 1988), and strandings recorded during 1988-1997 (Barros *et al.* 1998) indicate that this species accounts for about 83% of all *Kogia* spp. strandings in this area. During the period 1990-October 1998, 21 pygmy sperm whale strandings occurred in the northeastern U.S. (Delaware, New Jersey, New York and Virginia), whereas 194 strandings were documented along the U.S. Atlantic coast between North Carolina and the Florida Keys in the same period. Remains of plastic bags and other marine debris have been retrieved from the stomachs of 13 stranded pygmy sperm whales in the southeastern U.S. (Barros *et al.* 1990, 1998), and at least on one occasion the ingestion of plastic debris is believed to have been the cause of death. During the period 1987-1994, 1 animal had possible propeller cuts on its flukes.

Rehabilitation challenges for *Kogia* spp. are numerous due to limited knowledge regarding even the basic biology of these species. Advances in recent rehabilitation success has potential implications for future release and tracking of animals at sea to potentially provide information on distribution, movements and habitat use of these species (Manire *et al*., 2004).

STATUS OF STOCK

The status of the pygmy sperm whale relative to OSP in the western U.S. Atlantic EEZ is unknown. This species is not listed as endangered or threatened under the Endangered Species Act. There is insufficient information with which to assess population trends. Total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR and therefore, cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is a strategic stock because the 1999-2003 estimated average annual fishery-related mortality to pygmy sperm whales exceeds PBR.

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SHORT-FINNED PILOT WHALE (*Globicephala macrorhynchus*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

There are two species of pilot whales in the western North Atlantic: the Atlantic or long-finned pilot whale (*Globicephala melas*) and the short-finned pilot whale (*G. macrorhynchus*). These species are difficult to differentiate to the species level at sea; therefore, some of the descriptive material below refers to *Globicephala* spp. and is identified as such. The species boundary is considered to be in the New Jersey to Cape Hatteras area. Sightings north of this area are likely *G. melas*. The short-finned pilot whale is distributed worldwide in tropical to warm temperate waters (Leatherwood and Reeves 1983). The northern extent of the range of this species within the U.S. Atlantic Exclusive Economic Zone (EEZ) is generally thought to be Cape Hatteras, North Carolina (Leatherwood and Reeves 1983). Sightings of these animals in U.S. Atlantic EEZ occur in oceanic waters (Mullin and Fulling 2003) and along the continental shelf and continental slope in the northern Gulf of Mexico (Hansen *et al.* 1996; Mullin and Hoggard 2000; Mullin and Fulling 2003). There is no information on stock differentiation for the Atlantic population.

POPULATION SIZE

The total number of short-finned pilot whales off the eastern U.S. and Canadian Atlantic coast is unknown, although estimates from selected regions of the habitat do exist for select time periods. Sightings were almost exclusively in the continental shelf edge and continental slope areas (Fig. 1). Two estimates were derived from catch data and population models that estimated the abundance of the entire stock. Seasonal estimates are available from selected regions in U.S. waters during spring, summer and autumn 1978-82, August 1990, June-July 1991, August-September 1991, June-July 1993, July-September 1995, July-August 1998, and June-August 2004. Because long-finned and short-finned pilot whales are difficult to identify at sea, seasonal abundance estimates were reported for *Globicephala* spp., both long-finned and short-finned pilot whales. One estimate is available from the Gulf of St. Lawrence.

Mitchell (1974) used cumulative catch data from the 1951-61 drive fishery off Newfoundland to estimate the initial population size (ca. 50,000 animals).

Mercer (1975) used population models to estimate a population in the same region of between 43,000-96,000 long-finned pilot whales, with a range of 50,000-60,000 being considered the best estimate.

An abundance of 11,120 (CV=0.29) *Globicephala* spp. was estimated from an aerial survey program conducted from 1978 to 1982 on the continental shelf and shelf edge waters between Cape Hatteras, North Carolina, and Nova Scotia (CETAP 1982). An abundance of 3,636 (CV=0.36) *Globicephala* spp. was estimated from a June and July 1991 shipboard line-transect sighting survey conducted primarily between the 200 and 2,000 m isobaths from Cape Hatteras to Georges Bank (Waring *et al.* 1992; Waring 1998). An abundance of 3,368 (CV=0.28) and 5,377 (CV=0.53) *Globicephala* spp. was estimated from line-transect aerial surveys conducted from August to September 1991 using the Twin Otter and AT-11, respectively (Anon. 1991). As recommended in the GAMMS Workshop Report (Wade and Angliss 1997), estimates older than eight years are deemed unreliable, and therefore should not be used for PBR determinations. Further, due to changes in survey methodology, these data should not be used to make comparisons to more current estimates.

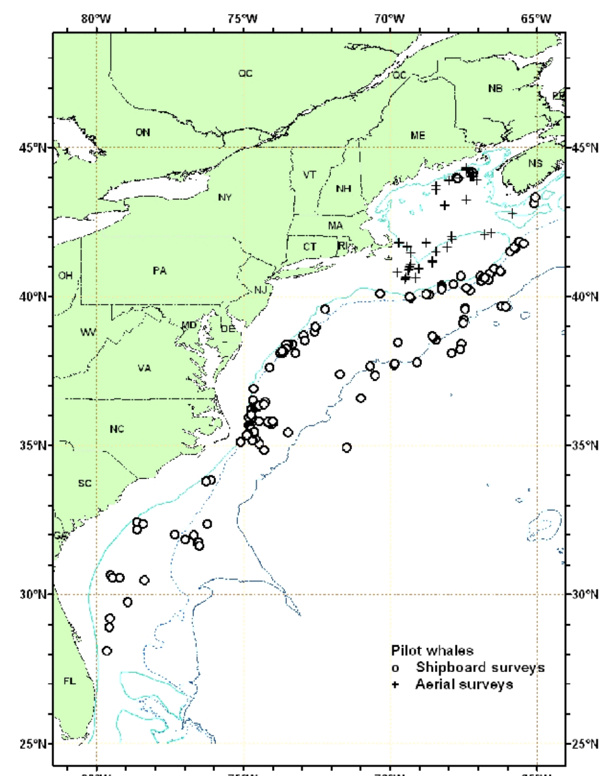

Figure 1. Distribution of pilot whale sightings from NEFSC and SEFSC vessel and aerial summer surveys during 1998 and 2004. Isobaths are at 100 and 1,000 m.

An abundance of 668 (CV=0.55) *Globicephala* spp. was estimated from a June and July 1993 shipboard line-transect survey conducted principally between the 200m and 2,000m isobaths from the southern edge of Georges Bank, across the Northeast Channel to the southeastern edge of the Scotian Shelf (Table 1; Anon. 1993). Data were collected by two alternating teams that searched with 25x150 binoculars and were analyzed using DISTANCE

(Buckland *et al*. 2001; Thomas *et al.* 1998). Estimates include school-size bias, if applicable, but do not include corrections for *g(0)* or dive-time. Variability was estimated using bootstrap resampling techniques.

An abundance of 8,176 (CV=0.65) *Globicephala* spp. was estimated from a July to September 1995 sighting survey conducted by two ships and an airplane that covered waters from Virginia to the mouth of the Gulf of St. Lawrence (Table 1; Palka *et al.,* Unpubl. Ms.). Total track line length was 32,600km. The ships covered waters between the 50 and 1000 fathom depth contour lines, the northern edge of the Gulf Stream, and the northern Gulf of Maine/Bay of Fundy region. The airplane covered waters in the mid-Atlantic from the coastline to the 50 fathom depth contour line, the southern Gulf of Maine, and shelf waters off Nova Scotia from the coastline to the 1000 fathom depth contour line. Data collection and analysis methods used were described in Palka (1996).

Kingsley and Reeves (1998) obtained an abundance estimate of 1,600 long-finned pilot whales (CV=0.65) from a late August and early September aerial survey of cetaceans in the Gulf of St. Lawrence in 1995 and 1998 (Table 1). Based on an examination of long-finned pilot whale summer distribution patterns and information on stock structure, it was deemed appropriate to combine these estimates with NMFS 1995 summer survey data. The best 1995 abundance estimate for *Globicephala* spp., 9,776 (CV=0.55), was the sum of the estimates from the U.S. and Canadian surveys, where the estimate from the U.S. survey was 8,176 (CV=0.65) and from the Canadian, 1,600 (CV=0.65).

An abundance of 9,800 (CV=0.34) *Globicephala* spp. was estimated from a line-transect survey conducted during July 6 to September 6, 1998, by a ship and plane that surveyed 15,900km of track line in waters north of Maryland (38° N) (Fig. 1; Palka *et al.,* Unpubl. Ms.).). Shipboard data were analyzed using the modified direct duplicate method (Palka 1995) that accounts for school size bias and *g(0)*, the probability of detecting a group on the track line. Aerial data were not corrected for *g(0)*.

An abundance of 5,109 (CV=0.41) *Globicephala* spp. was estimated from a shipboard line-transect survey conducted between 8 July and 17 August 1998 that surveyed 4,163km of track line in waters south of Maryland (38°N) (Fig. 1; Mullin and Fulling 2003). Abundance estimates were made using the program DISTANCE. This estimate is a recalculation of the same data reported in previous SARs. For more details see Mullin and Fulling (2003).

An abundance of 15,436 (CV= 0.33) for *Globicephala* spp. was estimated from a line transect sighting survey conducted during June 12 to August 4, 2004 by a ship and plane that surveyed 10,761 km of track line in waters north of Maryland (about 38° N) to the Bay of Fundy (about 45° N) (Figure 1; Palka unpubl.). Shipboard data were collected using the two independent team line transect method and analyzed using the modified direct duplicate method (Palka 1995) accounting for biases due to school size and other potential covariates, reactive movements (Palka and Hammond 2001), and g(0), the probability of detecting a group on the track line. Aerial data were collected using the Hiby circle-back line transect method (Hiby 1999) and analyzed accounting for g(0) and biases due to school size and other potential covariates (Figure 1; Palka unpubl.).

A shipboard survey of the U.S. Atlantic outer continental shelf and continental slope (water depths $\geq$50m) between Florida and Maryland (27.5and 38 ºN latitude) was conducted during June-August, 2004. The survey employed two independent visual teams searching with 50x bigeye binoculars. Survey effort was stratified to include increased effort along the continental shelf break and Gulf Stream front in the mid-Atlantic. The survey included 5,659 km of trackline, and there were a total of 473 cetacean sightings. Sightings were most frequent in waters north of Cape Hatteras, North Carolina along the shelf break. Data were analyzed to correct for visibility bias (g(0)) and group-size bias employing line transect distance analysis and the direct duplicate estimator (Palka 1995; Buckland *et al.*, 2001). The resulting abundance estimate for *Globicephala* spp. between Florida and Maryland was 15,411 (CV=0.43).

The best 2004 abundance estimate for *Globicephala* spp.is the sum of the estimates from the two 2004 U.S. Atlantic surveys, 30,847 (CV=0.27), where the estimate from the northern U.S. Atlantic is 15,436 (CV=0.33), and from the southern U.S. Atlantic is 15,411 (CV=0.43). This joint estimate is considered the best because together these two surveys have the most complete coverage of the species' habitat.

Table 1. Summary of abundance estimates for the western North Atlantic *Globicephala* spp. Month, year, and area covered during each abundance survey, and resulting abundance estimate (N_{best}) and coefficient of variation (CV).

Month/Year	Area	N_{best}	CV
Jul-Sep 1998	Maryland to Gulf of St. Lawrence	9,800	0.34
Jul-Aug 1998	Florida to Maryland	5,109	0.41
Jul-Sep 1998	Florida to Gulf of St. Lawrence (COMBINED)	14,909[1]	0.26
Jun-Aug 2004	Maryland to Bay of Fundy	15,436	0.33
Jun-Aug 2004	Florida to Maryland	15,411	0.43

Jun-Aug 2004	Florida to Bay of Fundy (COMBINED)	30,847[1]	0.27

[1] This is the combined estimate for the two survey areas

Minimum Population Estimate

The minimum population estimate is the lower limit of the two-tailed 60% confidence interval of the log-normally distributed best abundance estimate. This is equivalent to the 20th percentile of the log-normal distribution as specified by Wade and Angliss (1997). The best estimate of abundance for *Globicephala* sp. is 30,847 (CV=0.27). The minimum population estimate for *Globicephala* spp. is 24,697.

Current Population Trend

There are insufficient data to determine the population trends for *Globicephala* spp..

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size for *Globicephala* spp. is 24,697. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status relative to optimum sustainable population (OSP) is assumed to be 0.48 because the CV of the average mortality estimate is between 0.3-0.6 (Wade and Angliss 1997), and because this stock is of unknown status. PBR for the western North Atlantic *Globicephala* spp. is 237.

ANNUAL HUMAN-CAUSED MORTALITY

Fishery Information

Detailed fishery information are reported in Appendix III. Total fishery-related mortality and serious injury cannot be estimated separately for the two species of pilot whales in the U.S. Atlantic EEZ because of the uncertainty in species identification by fishery observers. The Atlantic Scientific Review Group advised adopting the risk-averse strategy of assuming that either species might have been subject to the observed fishery-related mortality and serious injury. Total annual estimated average fishery-related mortality or serious injury of this stock during 1999-2003 in the U.S. fisheries listed below was 201 pilot whales (CV=0.40) (Table 2).

The distribution of long-finned pilot whale, a northern species, overlaps with that of the short-finned pilot whale, a predominantly southern species, between 35°30'N to 38°00'N (Leatherwood *et al.* 1976). Although long-finned pilot whales are most likely taken in the waters north of Delaware Bay, many of the pilot whale takes are not identified to species and bycatch does occur in the overlap area. In this summary, therefore, fishing interactions are considered for undifferentiated pilot whales (*Globicephala* spp.).

Earlier Interactions

Prior to 1977, there was no documentation of marine mammal bycatch in distant-water fleet (DWF) activities off the northeast coast of the U.S.. A fishery observer program, which has collected fishery data and information on incidental bycatch of marine mammals, was established in 1977 with the implementation of the Magnuson Fisheries Conservation and Management Act (MFCMA). Foreign fishing operations for squid ceased at the end of the 1986 fishing season, and for mackerel, at the end of the 1991 fishing season.

During 1977-1991, observers in this program recorded 436 pilot whale mortalities in foreign-fishing activities (Waring *et al.* 1990; Waring 1995). A total of 391 (90%) were taken in the mackerel fishery, and 41 (9%) occurred during *Loligo* and *Illex* squid-fishing operations. This total includes 48 documented takes by U.S. vessels involved in joint venture fishing operations in which U.S. captains transfer their catches to foreign processing vessels. Due to temporal fishing restrictions, the bycatch occurred during winter/spring (December to May) in continental shelf and continental shelf edge waters (Fairfield *et al.* 1993; Waring 1995); however, the majority of the takes occurred in late spring along the 100m isobath. Two animals were also caught in both the hake fishery and tuna longline fisheries (Waring *et al.* 1990).

Bycatch has been observed by NMFS Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, bluefin tuna purse seine, North Atlantic bottom trawl, Atlantic squid, mackerel, butterfish trawl, and mid-Atlantic coastal gillnet fisheries, but no mortalities or serious injuries have been documented in the Northeast sink gillnet fishery.

Pelagic Drift Gillnet

The estimated total number of hauls in the pelagic drift gillnet fishery increased from 714 in 1989 to 1,144 in 1990; thereafter, with the introduction of quotas, effort was severely reduced. In 1996 and 1997, NMFS issued management regulations which prohibited the operation of this fishery in 1997. Further, in January 1999 NMFS issued a Final Rule to prohibit the use of driftnets (*i.e.*, permanent closure) in the North Atlantic swordfish fishery (50 CFR Part 630). Examination of the species composition of the catch and locations of the fishery throughout the year, suggested that the pelagic drift gillnet fishery be stratified into two strata, a southern or winter stratum, and a northern or summer stratum. Estimates of the total bycatch from 1989 to 1993 were obtained using the aggregated (pooled 1989-1993) catch rates, by stratum (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques. Between 1989 and 1998, 87 mortalities were observed in the large pelagic drift gillnet fishery. The annual fishery-related mortality (CV in parentheses) was 77 in 1989 (0.24), 132 in 1990 (0.24), 30 in 1991 (0.26), 33 in 1992 (0.16), 31 in 1993 (0.19), 20 in 1994 (0.06), 9.1 in 1995 (0), 11 in 1996 (.17), no fishery in 1997 and 12 in 1998 (0). Since this fishery no longer exists it has been excluded from Table 2. Pilot whales were taken along the continental shelf edge, northeast of Cape Hatteras in January and February. Takes were recorded at the continental shelf edge east of Cape Charles, Virginia, in June. Pilot whales were taken from Hydrographer Canyon along the Great South Channel to Georges Bank from July to November. Takes occurred at the Oceanographer Canyon continental shelf break and along the continental shelf northeast of Cape Hatteras in October-November.

Pelagic Pair Trawl

The pelagic pair trawl fishery operated as an experimental fishery from 1991 to 1995. This fishery ceased operations in 1996 when NMFS rejected a petition to consider pair trawl gear as an authorized gear type in the Atlantic tunas fishery. Five pilot whale (*Globicephala* sp.) mortalities were reported in the self-reported fisheries information in 1993. In 1994 and 1995 observers reported 1 and 12 mortalities, respectively. The estimated fishery-related mortality to pilot whales in the western U.S. Atlantic attributable to this fishery in 1994 was 2.0 (CV=0.49) and 22 (CV=0.33) in 1995. Since this fishery no longer exists, it has been excluded from Table 2.

Pelagic Longline

Total effort, excluding the Gulf of Mexico, for the pelagic longline fishery, based on mandatory self-reported fisheries information, from 1991 to 2000.(Cramer 1994; Scott and Brown 1997; Johnson *et al.* 1999; Yeung 1999a; Yeung *et al.* 2000). In the 2001 Stock Assessment Report, the annual effort has been recalculated to include those sets targeting other species in conjunction with tuna/swordfish, instead of just effort that exclusively targeted tuna/swordfish as in previous reports (Johnson *et al.* 1999; Yeung 1999a). The fishery has been observed from January to March off Cape Hatteras, in May and June in the entire mid-Atlantic, and in July through December in the mid-Atlantic Bight and off Nova Scotia.

Most of the estimated marine mammal bycatch was from U.S. Atlantic EEZ waters between South Carolina and Cape Cod (Johnson *et al.* 1999). Pilot whales are frequently observed to feed on hooked fish, particularly big-eye tuna (NMFS unpublished data). Between 1992 and 2003,102 pilot whales (including 2 identified as a short-finned pilot whales) were released alive, including 54 that were considered seriously injured (of which 1 was identified as a short-finned pilot whale), and 5 mortalities were observed.

The estimated fishery-related mortality to pilot whales in the U.S. Atlantic (excluding the Gulf of Mexico) attributable to this fishery was: 127 in 1992 (CV=1.00), 93 in 1999 (CV=1.00)24 in 2000 (CV=1.0), 20 in 2001 (CV=0.7), 2 (CV=0.54) in 2002, and 0 (zero) in 2003. The estimated serious injuries were 40 (CV=0.71) in 1992, 19 (CV=1.00) in 1993, 232 (CV=0.53) in 1994, 345 (CV= 0.51) in 1995, 0 from 1996 to 1998, 288 (CV=0.74) in 1999; 109 (CV=1.0) in 2000 (includes 37 estimated short-finned pilot whales in 1995 (CV=1.00)); 50 (CV=0.48) in 2001, and 52 (CV=0.49) in 2002, and 21 (CV=NA) in 2003. The average 'combined' annual mortality in 1999-2003 was 1 132 pilot whales (CV= . 0.49) (Table 2). Animals released alive but judged to have been seriously injured are combined with mortalities in the category 'combined mortality'. No pilot whale takes have been observed in the Gulf of Mexico fishery. The majority of pilot whale bycatch was concentrated along the continental shelf break between New Jersey and Cape Hatteras, occurring primarily in the late summer to early fall (Yeung 2001; Garrison, 2003; Garrison and Richards, 2004).

Bluefin Tuna Purse Seine

The tuna purse seine fishery between Cape Hatteras and Cape Cod is directed at small and medium bluefin and skipjack for the canning industry, while north of Cape Cod, purse seine vessels are directed at large medium and giant bluefin tuna (NMFS 1995). Two interactions with pilot whales were observed in 1996. In one interaction, 'he net was actually pursed around one pilot whale, the rings were released and the animal escaped alive, condition unknown. This set occurred east of the Great South Channel and just north of the Cultivator Shoals region on Georges Bank. In a second interaction, 5 pilot whales were encircled in a set. The net was opened prior to pursing to let the whales swim free, apparently uninjured. This set occurred on the Cultivator Shoals region on Georges Bank. Since 1996, this fishery has not been observed.

Southern New England/Mid-Atlantic Squid, Mackerel, Butterfish Trawl Fisheries

Because of spatial and temporal differences in the harvesting of *Illex* and *Loligo* squid, and Atlantic mackerel, each one of these sub-fisheries are described separately. The *Illex* and *Loligo* squid fisheries are managed by moratorium permits, gear and area restrictions, quotas, and trip limits. The Atlantic mackerel and butterfish fisheries are managed by an annual quota system.

Historically, the mid-Atlantic mackerel and squid trawl fisheries were combined into the Atlantic mid-water trawl fishery in the revised proposed list of fisheries in 1995. The mackerel trawl fishery was classified as a Category II fishery since 1990 and the squid fishery was originally classified as a Category II fishery in 1990, but was reclassified as a Category III fishery in 1992. The combined fishery was then reclassified as a Category II fishery in 1995.

***Illex* Squid**

The U.S. domestic fishery, ranging from Southern New England to Cape Hatteras North Carolina, reflects patterns in the seasonal distribution of *Illex* squid (*Illex illecebrosus*). *Illex* are harvested offshore mainly by small mesh otter trawlers when they are distributed in continental shelf and slope waters during the summer months (June-September)(Clark ed. 1998). Since 1996, 45% of all pilot whale takes observed were caught incidental to *Illex* squid fishing operations; 1 in 1996, 1 in 1998 and 2 in 2000. Annual observer coverage of this fishery has varied widely and reflects only the months when the fishery is active. The estimated fishery-related mortality of pilot whales attributable to this fishery was: 45 in 1996 (CV=1.27), 0 in 1997, 85 in 1998 (CV=0.65), 0 in 1999, 34 in 2000 (CV=0.65) and 0 in 2001. The average annual mortality between 1998 and 2002 was 30 pilot whales (CV=0.50) (Table 2).

***Loligo* Squid**

The U.S. domestic fishery for *Loligo* squid (*Loligo pealeii*) occurs mainly in Southern New England and mid-Atlantic waters. Fishery patterns reflect *Loligo* seasonal distribution where most effort is directed offshore near the edge of the continental shelf during the fall and winter months (October-March), and inshore during the spring and summer months (April-September) (Clark ed. 1998). This fishery is dominated by small-mesh otter trawlers, but substantial landings are also taken by inshore pound nets and fish traps during the spring and summer months (Clark ed. 1998). Only one pilot whale incidental take has been observed in *Loligo* squid fishing operations since 1996. The one take was observed in 1999 in the offshore fishery. No pilot whale takes have been observed in the inshore fishery. The estimated fishery-related mortality of pilot whales attributable to the fall/winter offshore fishery was 0 between 1996 and 1998, 49 in 1999 (CV=0.97) and 0 between 2000 and 2003. The average annual mortality between 1999 and 2003 was 10 pilot whales (CV=0.97) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Atlantic Mackerel

The U.S. domestic fishery for Atlantic mackerel (*Scomber scombrus*) occurs primarily in the Southern New England and mid-Atlantic waters between the months of January and May (Clark ed. 1998). This fishery is dominated by mid-water (pelagic) trawls. No incidental takes of pilot whales have been observed in the domestic mackerel fishery.

A U.S. joint venture (JV) fishery was conducted in the mid-Atlantic region from February to May 1998. NMFS maintained 100% observer coverage of the foreign joint venture vessels where 152 transfers from the U.S. vessels were observed. No incidental takes of pilot whales have been observed in the mackerel fishery. The former distant water fleet fishery has been non-existent since 1977. There is also a mackerel trawl fishery in the Gulf of Maine that generally occurs during the summer and fall months (May-December) (Clark ed. 1998). There have been no observed incidental takes of pilot whales reported for the Gulf of Maine fishery.

Southern New England/Mid-Atlantic Mixed Groundfish Trawl Fisheries

This fishery occurs year round, ranging from Cape Cod Massachusetts to Cape Hatteras North Carolina. It represents a variety of individual sub-fisheries that include but are not limited to; monkfish, summer flounder (fluke), winter flounder, silver hake (whiting), spiny and smooth dogfish, scup, and black sea bass. There was one observed take in this fishery reported in 1999. The estimated fishery-related mortality for pilot whales attributable to this fishery was: 0 in 1996-1998, 228 in 1999 and 0 in 2000-2003. The average annual mortality between 1999 and 2003 was 46 pilot whales (CV=1.03) (Table 2). However, these estimates should be viewed with caution due to the extremely low (<1%) observer coverage.

Northeast Atlantic (Gulf of Maine/Georges Bank) Herring Fishery

There were no marine mammal takes observed from the domestic mid-water trawl fishing trips during 1999-2003.

A U.S. joint venture (JV) mid-water (pelagic) trawl fishery was conducted on Georges Bank from August - December 2001. A Total Allowable Level of Foreign Fishing (TALFF) was also granted during the same time period. Eight pilot whales were incidentally captured in a single mid-water trawl during JV fishing operations (TALFF) (Table 2). The total mortality attributed to the Atlantic herring mid-water trawl fishery from 1999-2003 was 2 animals (Table 2).

Mobile Gear Restricted Areas

Mobile gear restricted areas (GRA's) were put in place for fishery management purposes in November 2000. The intent of the GRA is to reduce bycatch of scup. The GRA's are spread out in time and space along the edge of the Southern New England and mid-Atlantic continental shelf region (between 100-1000 meters). These seasonal closures are targeted at trawl gear with small mesh sizes (<4.5 inches). The Atlantic herring and Atlantic mackerel trawl fisheries are exempt from the GRA's. A temporary exemption was also granted for the *Loligo* squid fishery. For detailed information regarding GRA's refer to FR/Vol. 66, No. 41.

Mid-Atlantic Coastal Gillnet

This fishery, which extends from North Carolina to New York, is actually a combination of small vessel fisheries that target a variety of fish species, some of which operate right off the beach. No pilot whales were taken in observed trips during 1993-1997. One pilot whale was observed taken in 1998, 0 during 1999-2003 (Table 2). Observed effort was scattered between New York and North Carolina from 1 to 50 miles off the beach. All bycatches were documented during January to April. Using the observed takes, the estimated annual mortality (CV in parentheses) attributed to this fishery was 7 in 1998 (1.1). Average annual estimated fishery-related mortality attributable to this fishery between 1999 and 2003 was 0 (zero) pilot whales.

CANADA

An unknown number of pilot whales have also been taken in Newfoundland and Labrador, and Bay of Fundy groundfish gillnets, Atlantic Canada and Greenland salmon gillnets, and Atlantic Canada cod traps (Read 1994).

Between January 1993 and December 1994, 36 Spanish deep-water trawlers, covering 74 fishing trips (4,726 fishing days and 14,211 sets), were observed in NAFO Fishing Area 3 (off the Grand Banks) (Lens 1997). A total of 47 incidental catches were recorded, which included 1 long-finned pilot whale. The incidental mortality rate for pilot whales was 0.007/set.

In Canada, the fisheries observer program places observers on all foreign fishing vessels, on between 25% and 40% of large Canadian vessels (greater than 100ft), and on approximately 5% of small vessels (Hooker *et al.* 1997). Fishery observer effort off the coast of Nova Scotia during 1991-1996 varied on a seasonal and annual basis, reflecting changes in fishing effort (see Figure 3, Hooker *et al.* 1997). During the 1991-1996 period, long-finned pilot whales were bycaught (number of animals in parentheses) in bottom trawl (65); midwater trawl (6); and longline (1) gear. Recorded bycatches by year were: 16 in 1991, 21 in 1992, 14 in 1993, 3 in 1994, 9 in 1995 and 6 in 1996. Pilot whale bycatches occurred in all months except January-March and September (Hooker *et al.* 1997).

Table 2. Summary of the incidental mortality and serious injury of pilot whales (*Globicephala sp.*) by commercial fishery including the years sampled (Years), the number of vessels active within the fishery (Vessels), the type of data used (Data Type), the annual observer coverage (Observer Coverage), the observed mortalities and serious injuries recorded by on-board observers, the estimated annual mortality and serious injury, the combined annual estimates of mortality and serious injury (Estimated Combined Mortality), the estimated CV of the combined estimates (Estimated CVs) and the mean of the combined estimates (CV in parentheses).

Fishery	Years	Vessels[4]	Data Type [1]	Observer Coverage[2]	Observed Serious Injury	Observed Mortality	Estimated Serious Injury	Estimated Mortality	Estimated Combined Mortality	Estimated CVs	Mean Annual Mortality
SNE/mid-Atlantic Illex Squid Trawl	99-03	73 [5]	Obs. Data Dealer	.028, .111, .00, .00, tbd	,, 0, 0, NA, NA,0	, 0, 2, NA, NA, 0	, 0, 0, NA, NA, 0	, 0 34, NA, NA, 0	, 0 34, NA, NA, 0	0, 0.65, NA, NA, 0	11 (0.65)
SNE/mid-Atlantic Loligo Squid Trawl (offshore)	99-03	384 [5]	Obs. Data Dealer	, .009, .011, .012, .005, NA	0, 0, 0, 0, 0	, 1, 0, 0, 0, 0	0, 0, 0, 0, 0	, 49, 0, 0, 0, 0	, 49, 0, 0, 0, 0	, 0.97, 0, 0, 0, 0	10 (0.97)
SNE/ mid-Atlantic Bottom Trawl	99-03	NA	Obs. Data Dealer	, .003, .003, .004, .005, NA	0, 0, 0, 0, 0	, 1[6], 0, 0, 0, 0	0, 0, 0, 0, 0	, 228, 0, 0, 0, 0	, 228, 0, 0, 0, 0	1.03, 0, 0, 0, 0	46 (1.03)
GOM/GB Herring Mid-Water Trawl JV and TALFF[9]	99-03	1999-2000=0 2001=10[8] 2002-2003=0	Obs. Data	NA, NA 1.00[7], NA, NA	0, 0, 0, 0, 0	, 0, 0, 11, 0, 0	0, 0, 0, 0, 0	0, 0, 0, 11, 0, 0	, 0, 0, 0, 11, 0, 0	NA	2 (NA)
Pelagic[3] Longline (exlcuding NED-E) [10]	99-03	, „ 198, 180, 152, 135, 116	Obs. Data Logbook	, .04 .04, .02, .04 , .02	, 4, 4, 4, 4, 2	, 1, 1, 1, 0, 0	, 288, 109, , 50, 52, 21	, 93, 24, 20, 2, 0	, 381,133, 70, 54, 21	, .79, .88, ., .50, .46, .77	132 (0.49)
Pelagic Longline - NED-E area only [3, 10]	2001-2003	180 sets, 482, 535NA, NA, 9, 14, 11	Obs. Data Logbook	1, 1, 1	0, 0,0	0,0,0	0,0,0	0,0,0	0,0,0	0	0

Mid-Atlantic Coastal Gillnet	99-03	NA	Obs. Data Dealer	., .02,.02, .02, .01, .01	0, 0, 0, 0, 0	, 0, 0, 0, 0, 0	0, 0, 0, 0, 0	, 0, 0, 0, NA[11], 0	, , 0, 0, 0, NA[11],0	0, 0, 0, NA[11], 0	0 (0)
TOTAL											201 (0.40)

1 Observer data (Obs. Data) are used to measure bycatch rates, and the data are collected within the Northeast Fisheries Science Center (NEFSC) Sea Sampling Program. Mandatory logbook data were used to measure total effort for the longline fishery. These data are collected at the Southeast Fisheries Science Center (SEFSC).

2 Observer coverage of the mid-Atlantic coastal gillnet fishery is measured in tons of fish landed. Observer coverage for the longline fishery are in terms of sets. The trawl fisheries are measured in trips.

3 1997-1998 mortality estimates were taken from Table 9a in Yeung *et al.* (NMFS Miami Laboratory PRD 99/00-13), and excludes the Gulf of Mexico. 1999-2000 mortality estimates were taken from Table 10 in Yeung 2000 (NOAA Technical Memorandum NMFS-SEFSC-467). 2001-2002 and 2003 mortality estimates were taken from Tables 5,7,and 10 in Garrison (2003) and Garrison and Richards (2004).

4 Number of vessels in the fishery are based on vessels reporting effort to the pelagic longline logbook.

5 These are numbers of potential fishing vessels based on permit holders in the 2002 fishery. Many of these vessels participate in the other fisheries and therefore the reported number of vessels are not additive across the squid, mackerel and butterfish fisheries. (67FR 65937).

6 The incidental take was observed on a trip than landed silver hake as the primary species.

7 During joint venture fishing operations, nets that are transferred from the domestic vessel to the foreign vessels for processing are observed on board the foreign vessel. There may be nets fished by domestic vessels that do not get transferred to a foreign vessel for processing and therefore would not be observed. During TALFF fishing operations all nets fished by the foreign vessel are observed.

8 Three foreign vessels and seven American vessels.

9 NA=No joint venture fishing effort for Atlantic mackerel.

10 An experimental program to test effects of gear characteristics, environmental factors, and fishing practices on marine turtle bycatch rates in the Northeast Distant (NED-E) water component of the fishery was conducted from June 1, 2001-December 31, 2003. Observer coverage was 100% during this experimental fishery. Summaries are provided for the pelagic longline EXCLUDING the NED-E area in one row and for ONLY the NED in the second row. No mortalities nor serious injuries were observed for pilot whales in the NED-E, though 1 pilot whale was caught alive and released without injury (Garrison, 2003; Garrison and Richards, 2004).

11 Sixty-five percent of sampling in the mid-Atlantic coastal gillnet by the NEFSC fisheries observer program was concentrated in one area off the coast of Virginia. Because of the low level of sampling that was not distributed proportionately throughout the mid-Atlantic region, observed mortality is considered unknown in 2002. The previous four year average (1999-1002, and 2003) estimated mortality was applied as the best representative estimate.

Other Mortality

Pilot whales have a propensity to mass strand throughout their range, but the role of human activity in these events is unknown. Between 2 and 120 pilot whales have stranded annually, either individually or in groups, in NMFS Northeast Region (Anon. 1993b) since 1980. From 1999-2003, 185 pilot whales (*Globicephala sp.*) have been reported stranded between Nova Scotia and Florida (Table 3), including several mass strandings as follows: 14 live mass stranded whales in 2000 and 3 in 2001 in Judique, Inverness County; 4 live mass stranded whales at Point Tupper, Inverness County in 2002; 11 mass stranded whales in 2000 and 57 in 2002 in Massachusetts; and 28 whales that stranded in Content Passage, Monroe County, FL (ocean side) on April 18, 2003. The fate of the animals is specified in Table 3.

Table 3. Pilot whales (*Globicephala macrohynchus*) strandings along the Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
Nova Scotia[1]	1	16[2]	3[3]	7[4]	2	29
Maine	0	0	5	2	1	8
New Hampshire	0	0	0	0	0	0
Massachusetts	6	13[5]	3	67[6]	5	94
Rhode Island	0	0	1	1	0	2
Connecticut	0	0	0	0	0	0
New York	1	1	1	0	0	3
New Jersey	1	0	0	0	6	7
Delaware	0	0	0	0	0	0
Maryland	1	0	0	0	0	1
Virginia	2	0	0	0	0	2
North Carolina	2[7]	0	2[8]	0	1[9]	5

South Carolina	0	0	1	0	1[10]	2
Georgia	0	1	0	0	0	1
Florida	2[11]	0	0	0	29[12, 13]	31
TOTALS	16	31	16	77	45	185

1 Data supplied by Tonya Wimmer, Nova Scotia Marine Animal Response Society (pers. comm.). NOTE: These strandings were NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.

2 Includes 14 mass live strandings at Judique, Inverness County on August 6, 2000 - 11 returned to sea

3 Three mass live stranded animals at Judique, Inverness County on July 19, 2001 - all returned to sea

4 Includes 4 mass live strandings at Point Tupper, Inverness County on January 11, 2002 - fate unreported.

5 Includes mass stranding of 11 animals in July 2000

6 Includes mass stranding of 57 animals in July 2002

7 Two long-finned pilot whales stranded in NC in 1999, reported to species

8 Two pilot whales stranded in NC in 2001 not identified to species

9 One pilot whale stranded in NC in 2003 not identified to species. NOTE: This stranding was NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.

10 Only moderate confidence on species identification as long-finned pilot whale

11 Two long-finned pilot whales reported in Florida identified to species

12 Includes mass live stranding of 28 short-finned pilot whales in Content Passage, Monroe County, FL (Ocean side) on April 19, 2003 - 12 animals died or were uthanized at the scene, 9 were returned to sea, 7 were taken into rehabilitation of which 2 subsequently died and 5 were released to sea on August 10, 2003. NOTE: These strandings were NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.

13 Signs of human interaction reported on 1 stranded animal (not part of the live mass stranding). NOTE: These strandings were NOT included in the long-finned pilot whale section, thus the table totals will be different, and will be updated in the next revision of the long-finned pilot whale stock assessment.

Short-finned pilot whales strandings (*Globicephala macrorhynchus*) have been reported stranded as far north as Nova Scotia (1990) Block Island, Rhode Island (2001) and long-finned pilot whales (*Globicephala melas*) as far south as South Carolina.

A potential human-caused source of mortality is from polychlorinated biphenyls (PCBs) and chlorinated pesticides (DDT, DDE, dieldrin, etc.), moderate levels of which have been found in pilot whale blubber (Taruski 1975; Muir *et al.* 1988; Weisbrod *et al.* 2000). Weisbrod *et al.* (2000) reported that bioaccumulation levels were more similar in whales from the same stranding group than animals of the same sex or age. Also, high levels of toxic metals (mercury, lead, cadmium) and selenium were measured in pilot whales harvested in the Faroe Island drive fishery (Nielsen *et al.* 2000). Similarly, Dam and Bloch (2000) found very high PCB levels in pilot whales in the Faroes. The population effect of the observed levels of such contaminants is unknown.

STATUS OF STOCK

The status of short-finned pilot whales relative to OSP in the U.S. Atlantic EEZ is unknown, but stock abundance may have been affected by reduction in foreign fishing, curtailment of the Newfoundland drive fishery for pilot whales in 1971, and increased abundance of herring, mackerel, and squid stocks. There are insufficient data to determine the population trends for this species. The species is not listed under the Endangered Species Act. The total fishery-related mortality and serious injury for this stock is not less than 10% of the calculated PBR, and therefore cannot be considered to be insignificant and approaching zero mortality and serious injury rate. This is not a strategic stock, . because the 1999-2003 estimated average annual fishery-related mortality to pilot whales, Globicephala spp. does not exceed PBR. The status has gone back and forth, because mortality has been close to PBR. In the last six editions of this stock assessment report, it has been designated as non-strategic in 1998 and 1999 and this year.

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SPINNER DOLPHIN (*Stenella longirostris*): Western North Atlantic Stock

STOCK DEFINITION AND GEOGRAPHIC RANGE

Spinner dolphins are distributed in oceanic and coastal tropical waters (Leatherwood *et al.* 1976). This is presumably an offshore, deep-water species (Schmidly 1981; Perrin and Gilpatrick 1994), and its distribution in the Atlantic is very poorly known. In the western North Atlantic, these dolphins occur in deep water along most of the U.S. coast south to the West Indies and Venezuela, including the Gulf of Mexico. Spinner dolphin sightings have occurred exclusively in deeper (>2,000 m) oceanic waters (CETAP 1982; Waring *et al.* 1992; NMFS, unpublished data) off the northeast U.S. coast. Stranding records exist from North Carolina, South Carolina, Florida and Puerto Rico in the Atlantic and in Texas and Florida in the Gulf of Mexico. Stock structure in the western North Atlantic is unknown.

POPULATION SIZE

The numbers of spinner dolphins off the U.S. or Canadian Atlantic coast are unknown, and seasonal abundance estimates are not available for this stock since it was rarely seen in any of the surveys.

Minimum Population Estimate

Present data are insufficient to calculate a minimum population estimate.

Current Population Trend

There are insufficient data to determine the population trends for this stock.

CURRENT AND MAXIMUM NET PRODUCTIVITY RATES

Current and maximum net productivity rates are unknown for this stock. For purposes of this assessment, the maximum net productivity rate was assumed to be 0.04. This value is based on theoretical modeling showing that cetacean populations may not grow at rates much greater than 4% given the constraints of their reproductive life history (Barlow *et al.* 1995).

POTENTIAL BIOLOGICAL REMOVAL

Potential Biological Removal (PBR) is the product of minimum population size, one-half the maximum productivity rate, and a "recovery" factor (MMPA Sec. 3. 16 U.S.C. 1362; Wade and Angliss 1997). The minimum population size is unknown. The maximum productivity rate is 0.04, the default value for cetaceans. The "recovery" factor, which accounts for endangered, depleted, threatened stocks, or stocks of unknown status, relative to optimum sustainable population (OSP), is assumed to be 0.5 because this stock is of unknown status. PBR for the western North Atlantic spinner dolphin is unknown because the minimum population size is unknown.

ANNUAL HUMAN-CAUSED MORTALITY AND SERIOUS INJURY

Fishery Information

Detailed fishery information is reported in Appendix III. Total annual estimated average fishery-related mortality and serious injury to this stock during 1999-2003 was zero spinner dolphins, as there were no reports of mortalities or serious injury to spinner dolphins (Yeung 2001; Garrison 2003; Garrison and Richards, 2004).

EARLIER INTERACTIONS

There was no documentation of spinner dolphin mortality or serious injury in distant-water fleet (DWF) activities off the northeast U.S. coast (Waring *et al.* 1990). No takes were documented in a review of Canadian gillnet and trap fisheries (Read 1994).

Bycatch has been observed by NMFS Sea Samplers in the now prohibited pelagic drift gillnet fishery, but no mortalities or serious injuries have been documented in the pelagic longline, pelagic pair trawl, Northeast sink gillnet, mid-Atlantic coastal gillnet, and North Atlantic bottom trawl fisheries.

Pelagic Drift Gillnet

One spinner dolphin mortality was observed in the pelagic driftnet between 1989 and 1993 and occurred east of Cape Hatteras in March 1993 (Northridge 1996). Estimates of total annual bycatch for 1994 and 1995 were estimated from the sum of the observed caught and the product of the average bycatch per haul and the number of unobserved hauls as recorded in self-reported fisheries information. Variances were estimated using bootstrap re-sampling techniques. Estimated annual mortality and serious injury attributable to this fishery (CV in parentheses) was 0.7 in 1989 (1. 00), 1.7 in 1990 (1.00), 0.7 in 1991 (1.00), 1.4 in 1992 (0.31), 0.5 in 1993 (1.00) and zero from 1994-1996. This fishery is no longer in operation.

Other Mortality

From 1999-2003, 9 spinner dolphins were reported stranded between Maine and Puerto Rico (Table 1). The total includes 2 animals stranded in North Carolina in 2001, 2 animals stranded in Puerto Rico in 2002, 4 mass stranded live animals in December 2003 in Flagler, Florida (all died on the scene), and 1 additional animal stranded in Florida in 2003. There were no indications of human interactions for these stranded animals.

Table 1. Spinner dolphin (*Stenella longirostris*) strandings along the U.S. Atlantic coast, 1999-2003

STATE	1999	2000	2001	2002	2003	TOTALS
North Carolina	0	0	2	0	0	2
South Carolina	0	0	0	0	0	0
Georgia	0	0	0	0	0	0
Florida	0	0	0	0	5[1]	5
Puerto Rico	0	0	0	2	0	2
TOTALS	0	0	2	2	5	9

[1]Florida live mass stranding of 4 animals in Flagler, Florida on December 29, 2003

STATUS OF STOCK

The status of spinner dolphins, relative to OPS, in the U.S. western North Atlantic EEZ is unknown. The species is not listed as threatened or endangered under the Endangered Species Act. There are insufficient data to determine the population size or trends and PBR cannot be calculated for this stock. No fishery-related mortality and serious injury has been observed since 1999; therefore, total fishery-related mortality and serious injury rate can be considered insignificant and approaching zero mortality and serious injury. This is not a strategic stock.

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